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The attached pages 4609 through 4612 are to replace four illegible pages appearing in *Nuclear Science Abstracts*, Volume 20, Number 20.

of these isomers are in the region of 1 msec. In each of the isotones ^{180m}W, ^{182m}Os, and ^{184m}Pt there were observed five prominent transitions. Four of these are the E2 transitions of the $8 \rightarrow 6 \rightarrow 4 \rightarrow 2 \rightarrow 0$ cascade in the ground-state band. The fifth transition is a very hindered E1 that de-excites an 8^-, 8 isomeric level and populates the 8^+, 0 level of the ground-state band. Despite the appreciable difference between the properties of these nuclei, as can be seen by comparing the well-developed rotational spectrum of ^{180}W with that of the poor rotor ^{184}Pt, the isomeric transitions seem to exhibit a striking similarity. In ^{184m}Pt, the isomeric decay also populates other levels. Among them were tentatively identified two members of the β-vibrational band. Their position relative to the ground-state band in this transitional-region nucleus is of special interest. (auth)

38028 PRECISION MEASUREMENT OF REACTION THRESHOLDS. Parks, P. B.; Beard, P. M.; Bilpuch, E. G.; Newson, H. W. (Duke Univ., Durham, N. C.). Nucl. Phys., 85: 504-12(1966).

The total yield of the ^{40}Ar(p,n)^{40}K reaction was measured in the energy region from E_p = 2.336 to 2.464 Mev. A very thin target produced in a special window-less gas target chamber allowed a proton energy spread less than 140 ev. With this very good resolution, at least 69 clearly resolved resonances are found. A technique for measuring precise neutron energies by neutron transmissions through suitable samples is discussed. Using this system the ground state Q-value was found to be -2.287 ± 0.001 Mev. In the same way, the ^{37}Cl(p,n)^{37}Ar reaction was found to have a Q-value of -1.597 ± 0.001 Mev, which is in excellent agreement with prior investigations. The technique should be accurate to less than $\frac{1}{5}$ kev if a suitable absolute energy standard can be established. (auth)

38029 THE DECAY OF ^{140}Ba. Moss, G. A.; McDaniels, D. K. (Univ. of Oregon, Eugene). Nucl. Phys., 85: 513-18(1966). (RLO-1921-8).

A Ge(Li) solid-state detector was used to investigate the gamma spectrum of the odd nucleus ^{140}La resulting from the decay of 12.8-day ^{140}Ba. Gamma rays of the following energies and relative intensities were observed in ^{140}La: 30.45 (30), 118.99(0.1), 132.69(3), 163.10(100), 304.82(94), 423.69 (56), 437.55(33) and 537.38(430) kev. A very weak (relative intensity $\leq$0.01) gamma ray at 44 kev was found and is included in the decay scheme. (auth)

38030 HALF LIVES OF LEVELS AT 405 kev IN ^{211}Bi AND 377 kev IN ^{53}Mn. Gorodetzky, S.; Schulz, N.; Bozek, E.; Knipper, A. (Institut de Recherches Nucleaires, Strasbourg). Nucl. Phys., 85: 519-28(1966). (In French).

The half lives of levels at 405 kev in ^{211}Bi and 377 kev in ^{53}Mn were measured by the delayed coincidence technique using a time-to-height converter. The respective values are $3.18 \pm 0.14 \times 10^{-10}$ and $1.17 \pm 0.06 \times 10^{-10}$ sec. These half lives indicate retardation factors of 1600 and 350 for the M1 component of these transitions. (auth)

38031 APPLICATION OF THE DELAYED COINCIDENCE TECHNIQUE TO MEASUREMENT OF THE SHORT MEAN LIVES IN ^{131}Xe AND ^{143}Pr. Gorodetzky, S.; Schulz, N.; Bozek, E.; Knipper, A. C. (Institut de Recherches Nucleaires, Strasbourg). Nucl. Phys., 85: 529-36(1966). (In French).

The half lives of excited states were determined from the simultaneous measurement of the two delayed coincidence curves from the self-comparison method. The results were checked with measurements in the standard comparison method, including a new determination $T_{\frac{1}{2}} = 2.5 \pm 0.5 \times 10^{-11}$ sec for the half life of the 412-kev state in ^{198}Hg. The combined results yield the following half lives: $4.7 \pm 0.5 \times 10^{-11}$ sec for the 364-kev state in ^{131}Xe and $4.9 \pm 0.7 \times 10^{-11}$ sec for the second excited state in ^{143}Pr. (auth)

38032 ANGULAR CORRELATIONS FOR E2 AND E3 TRANSITIONS IN COULOMB EXCITATION. Keddy, R. J. (Univ. of Witwatersrand, Johannesburg); Yoshizawa, Y. Nucl. Phys., 85: 537-44(1966).

A first-order perturbation theory calculation is made of the particle-gamma angular correlation coefficients used in Coulomb excitation. Both the E2 and E3 cases are treated and are separately compared to the results obtained from the sudden approximation theory for $t_{A2}/t_{A0} = 0$. (auth)

38033 ONE-PARAMETER FAMILY OF UNITARY ENSEMBLES. Gaudin, M. (Centre d'Etudes Nucleaires, Saclay, Gif-sur-Yvette, France). Nucl. Phys., 85: 545-75(1966). (In French).

A one-parameter family of unitary matrix ensembles is studied. The ensemble $E_2(z)$ of unitary random matrices, whose eigenvalues are $\epsilon_j = \exp 2\pi i\varphi_j$, is defined by the following joint probability density. $P(\epsilon_1\epsilon_2 \ldots \epsilon_n)d\varphi_1 d\varphi_2 \ldots d\varphi_n \propto \prod_{j<l} |(\epsilon_l - \epsilon_j)/(\epsilon_l - z\epsilon_j)|^2 d\varphi_1 d\varphi_2 \ldots d\varphi_n$. It realizes a continuous interpolation between the distribution of the eigenvalues in the Dyson unitary ensemble E_2 for $z = 0$ and the uniform distribution of n random points on the unit circle for $z = 1$. The thermodynamic analogy with a circular or linear classical repulsive gas at temperature $\beta^{-1} = \frac{1}{2}$ is developed. The isotherm $\beta = 2$ and the corresponding virial series are exactly calculated. All the correlation functions are given in the limit of an infinite linear gas or of an infinite series of levels. This model shows the short-range repulsion effect between eigenvalues but no long-range crystalline order, which is a strong characteristic of all ensembles so far studied. (auth)

38034 ANGULAR DISTRIBUTION, ANGULAR CORRELATIONS, AND PLANE POLARIZATION OF GAMMA RAYS OF THE REACTION ^{53}Cr(p,n)^{53}Mn. Gorodetzky, S.; Beck, F. A.; Bertini, R.; Bozek, E.; Knipper, A. (Institut de Recherches Nucleaires, Strasbourg). Nucl. Phys., 85: 576-92(1966). (In French).

Levels in the nucleus ^{53}Mn were studied from the observation of gamma rays emitted in the reaction ^{53}Cr(p,n)^{53}Mn. Measurements of their angular distribution, plane polarization, and gamma-gamma angular correlations with oriented initial level allowed the following spin and parity assignments: $J_1^\pi = \frac{5}{2}^-$ for the first excited state at 380 kev and $J_2^\pi = \frac{3}{2}^-$ for the second excited state at 1290 kev. Mixing ratios δ_γ for the gamma rays of 380, 910, and 1290 kev were determined. (auth)

38035 THE REACTIONS ^{63,65}Cu(t,p)^{65,67}Cu. Bjerregaard, J. H.; (Univ. of Copenhagen); Nathan, O.; Hinds, S.; Middleton, R. Nucl. Phys., 85: 593-605(1966).

Angular distributions of the Cu(t,p) reactions leading to states of ^{65}Cu and ^{67}Cu were measured at an incident energy of 12 Mev. For ^{65}Cu, 27 excited states were observed up to an excitation energy of 3.8 Mev; and for ^{67}Cu, 17 excited states were observed up to 4.3 Mev. The shapes of the angular distributions of the stronger proton groups are similar to known L = 0, L = 2, and L = 3 (t,p) distributions in other medium-weight nuclei. The data for ^{65}Cu are compared with the ^{64}Ni(^{3}He,d) results of Blair, and it is concluded that below 2.2 Mev the same levels are excited in the two experiments. The empirical L assignments for ^{65}Cu are in the majority of the cases consistent with the spin and parity assignments of Blair. The (t,p) data for ^{67}Cu show many similarities with the ^{65}Cu data, and this fact is used for tentative assignments of some levels in ^{67}Cu. (auth)

38036 ALPHA EMISSION FROM HEAVY NUCLEI INDUCED BY NEUTRONS OF 12 TO 23 Mev. Rubbino, A.; Zubke, D. (Goethe-Univ., Frankfurt am Main). Nucl. Phys., 85: 606-30(1966).

The α emission from neutron-induced reactions in heavy nuclei was experimentally investigated by means of several small reaction chambers. The irradiated elements were ^{107}Ag, ^{181}Ta, Ir, ^{197}Au, ^{209}Bi, ^{28}Si, and ^{29}Si. Energy spectra, angular distributions, and cross sections were analyzed for the neutron energy region E_n = (12–23) Mev. The results are discussed in a picture including all the known data on this subject and in terms of the contributions due to direct interaction and to evaporation. The α evaporation from neutron-induced reactions is found to be in satisfactory agreement with the statistical predictions. Some considerations for the direct interaction are made. (auth)

38037 SPECTRA OF PHOTO-ALPHA PARTICLES FROM NUCLEI IN THE REGION Z = 12 TO 30. Hoffmann, H.; Prowe, B.; Ullrich, H. (Technische Hochschule, Karlsruhe, Ger.). Nucl. Phys., 85: 631-40(1966).

Alpha particles produced in Mg, Al, S, Ni, Cu, and Zn by 31-Mev bremsstrahlung were measured at 130° with a solid-state detector telescope. Each of the observed spectra essentially consists of one broad peak, the position of which is shifted from about 3 Mev to 7 Mev as Z increases. By use of suitable values for the level density parameter, the shape of the spectra can be brought to an agreement with the statistical model. (auth)

38038 ESTIMATION OF NUCLEAR STRENGTH FUNCTIONS. Slavinskas, D. D.; Kennett, T. J. (McMaster Univ., Hamilton, Ont.). Nucl. Phys., 85: 641-52(1966).

A method is presented for obtaining unbias estimates of nuclear strength functions from experimental data. The model is based on the assumption that observed reduced neutron widths have a Porter-Thomas distribution and that the level spacings are distributed according to Wigner's surmise. Detailed attention is paid to estimate accuracies and a simple technique for calculating 68% confidence limits is provided. Numerical results are given for ^{75}As, ^{69}Ga, ^{71}Ga, ^{92}Mo, ^{94}Mo, ^{96}Mo, ^{90}Zr, ^{92}Zr, ^{94}Zr, and ^{96}Zr. (auth)

38039 E2 SURFACE RESONANCES IN SPHERICAL NUCLEI. Faessler, Amand (Univ. of Freiburg i. B.). Nucl. Phys., 85: 653-69(1966). (In German).

Quadrupole surface vibrations are considered for the protons and the neutrons separately in medium and heavy even-mass spherical nuclei. The two kinds of oscillations are strongly coupled by the symmetry term in the mass formula. The coupling constant between the proton and the neutron oscillations is calculated with the help of the symmetry energy. With the strong coupling, one gets vibrations of the protons and the neutrons in phase and in anti-phase. The former are the well-known low-energy quadrupole vibrations. The vibrations in anti-phase lie between 5 and 50 Mev in the case where one considers no interaction between the oscillations in phase and in anti-phase. If they do not lie immediately near closed shells, the anti-phase resonances (E2 surface resonances) lie between 15 and 20 Mev. The γ absorption cross section and the inelastic electron scattering cross section are considered for the detection of the E2 surface resonances. It is shown that the γ absorption cross section is negligible compared to the cross section of the E1 giant resonance. The inelastic electron scattering cross section is of the same order as for the giant resonance. Thus it is proposed to search for the E2 surface resonance by comparing the shape of the γ absorption and the electron scattering cross section in the excitation region between 10 and 25 Mev. (auth)

38040 THE E1 $\Delta K = 0$ TRANSITIONS IN DEFORMED ODD-MASS NUCLEI. Faessler, Amand; Udagawa, Takeshi, R. K. (Florida State Univ., Tallahassee). Nucl. Phys., 85: 670-8(1966).

The transition probabilities calculated for E1 $\Delta K = 0$ transitions using a pair reduction factor are smaller than experiment by factors up to 10^3. The expected mixing of the appropriate states with octupole vibrational bands due to vibration-particle interaction is computed. Whereas the mixing enhances E1 $\Delta K = 0$ transitions as desired, it does not effect E1 $\Delta K = 1$ transitions which were already in good agreement with experiment. This results because the E1 $\Delta K = 1$ octupole bands occur at higher energies and the E3 and E1 strengths are expected to be weaker for transitions into the $\Delta K = 1$ band. This calculation gives good agreement for the transition probabilities in the Eu isotopes where all parameters are available from the previous studies of ^{152}Sm. (auth)

38041 THE INFLUENCE OF THE PAIRING CORRELATIONS AND THE CORIOLIS FORCE ON THE E2 $\Delta K = 1$ TRANSITIONS IN DEFORMED ODD-MASS NUCLEI. Faessler, Amand (Univ. of California, Los Angeles). Nucl. Phys., 85: 679-88(1966).

The influence of the pairing correlations, of the Coriolis mixing, and of corrections to the Coriolis force mainly due to the rotation-vibration interaction on the E2 $\Delta K = 1$ transitions are studied. Because the rotational transitions are as strong as 200 single-particle units and the Nilsson transitions lie between 10^{-2} and 10^{-5} units, a small mixing can enhance the transition probability by several orders of magnitude. The pairing correlations affect the single-particle and the collective part of the transition probability in different ways. Because the single-particle part of the Coriolis force is negative under time reversal, the Coriolis mixing is not reduced by the pairing force. However, the single-particle transition probability can be diminished by more than a factor 100 due to the pair correlations. The agreement of the collective values with the experimental results is good, while the Nilsson transition probabilities with pair correlations are up to several orders of magnitude too small. (auth)

38042 THE ^{13}C(p,n)^{13}N REACTION NEAR THRESHOLD. Dietzsch, O. (Univ., Sao Paulo, Brazil). Nucl. Phys., 85: 689-96(1966).

The ^{13}C(p,n)^{13}N(g.s.) reaction was investigated in an energy range close to threshold using a long counter for detecting the neutrons. An excitation curve at 0° was measured from threshold (3.237 Mev) to 3.85 Mev. Angular distributions were obtained at ten proton bombarding energies from 3.30 to 3.75 Mev. The angular distributions are almost isotropic for energies below 3.35 Mev; the cross section decreases smoothly by ≈25% from 0 to 150°. As the energy is increased, the angular distributions become more anisotropic with peaks in both the forward and backward directions and a minimum that moves from ≈100° at E_p = 3.40 to ≈70° at 3.75 Mev. The results are compared with the conflicting data previously published. (auth)

38043 STRUCTURE EFFECTS IN THE CHARGE RADIUS OF SPHERICAL NUCLEI. Uher, Richard A.; Sorensen, Raymond A. (Carnegie Inst. of Tech., Pittsburgh). Nucl. Phys., 86: 1-46(1966).

Isotope and isomer shifts of the nuclear charge radius are calculated using the pairing plus quadrupole model. To accomplish this, the nuclear system is divided into a core plus a few valence particles. Monopole polarization of the core by the particle is taken into account in a phenomenological manner by assuming that the particles interact independently with the core. Quadrupole polarization of the core by the particles is estimated with the help of an effective quadrupole charge determined by fitting B(E2) transition rates of even-mass nuclei. The independent particle configuration of the valence nucleons is admixed by the pairing plus quadrupole interaction and the resulting wave functions are used to calculate isotope and isomer shifts of the charge radius. The results of even-mass to even-mass isotope shifts show good agreement with experiment, while the odd-even staggering effects observed in the isotope shift can not be obtained. Good agreement is obtained for the few isomer shifts which have been measured. (auth)

38044 PRECISE DETERMINATION OF THE SHAPE OF THE TWICE-FORBIDDEN BETA SPECTRUM OF ^{137}Cs. Hsue, S. T.; Langer, L. M.; Tang, S. M. (Indiana Univ., Bloomington). Nucl. Phys., 86: 47-55(1966).

The shape of the twice-forbidden beta spectrum in the decay of ^{137}Cs was measured in a magnetic spectrometer. By employing an energy-sensitive semiconductor detector at the focus, it was possible to demand that the recorded particles have the correct energy signature corresponding to the momentum setting of the magnetic field. An extremely high degree of discrimination was thus provided against detection of scattered electrons from the intense, low-energy inner group and the internal conversation lines. The shape of the outer group could be fitted with $S \propto q^2 + \lambda^2 p^2$ with $\lambda^2 = 0.004 \pm 0.002$ or with $S = L_0 q^2 + 9\lambda^2 L_1$ with $\lambda^2 = 0.005 + 0.002$. The end-point and intensity of the outer group are 1.176 ± 0.001 Mev and 6.0 ± 0.5%. The end-point and intensity of the inner group are 0.514 ± 0.001 Mev and 94.0 ± 0.5%. The K-internal conversion coefficient is α_K = 0.101 ± 0.007. (auth)

38045 ABOUT THE RESONANCE BEHAVIOR OF ISOSPIN FORBIDDEN NUCLEAR REACTIONS. Mueller, Kh. (Central Inst. for Nuclear Research, Rossendorf, Ger.). Nucl. Phys., 86: 56-64(1966).

The coherence width $\bar{\Gamma}$ for fluctuations in nuclear reactions around 20-Mev excitation energy of the compound nucleus increases drastically with decreasing mass numbers. From this it can be shown that there should exist a region of mass numbers where the violation of isospin selection rules is caused by only a few resonances. For this resonance region, a two-resonance formula for isospin-forbidden reactions is derived. (auth)

380 FURTHER MEASUREMENTS AND ZERO-RANGE DWBA CALCULATIONS FOR THE $^{52}Cr(d,p)^{53}Cr$ REACTION. Alty, J. L.; Green, L. L.; Jones, G. D.; Sharpey-Schafer, J. F. (Univ. of Liverpool). Nucl. Phys., 86: 65-88(1966).

An analysis of angular distributions in the $^{52}Cr(d,p)^{53}Cr$ reaction is made with zero-range DWBA calculations without spin-orbit terms. The variation of the predicted spectroscopic factors with the incident deuteron energy, the set of deuteron optical parameters used, the cut-off, and the neutron wave function is examined. (auth)

38047 FINITE-RANGE DISTORTED WAVE CALCULATIONS FOR THE $^{52}Cr(d,p)^{53}Cr$ REACTION. Mines, J. R. (Univ. of Liverpool). Nucl. Phys., 86: 89-101(1966).

The importance of finite-range and nonlocality corrections in distorted-wave calculations for the $^{52}Cr(d,p)^{53}Cr$ reaction is investigated. (auth)

38048 DECAY OF ^{131}Ce. Norris, A. E.; Friedlander, G.; Franz, E. M. (Brookhaven National Lab., Upton, N. Y.). Nucl. Phys., 86: 102-12(1966). (BNL-10050).

The nuclide ^{131}Ce was produced by (^4He,3n) and (^3He,2n) reactions on barium enriched in ^{130}Ba. A 10-min activity in chemically separated cerium was identified as ^{131}Ce by timed separations of its ^{131}La and ^{131}Ba descendants. The 10-min ^{131}Ce was found to decay principally by electron capture, with 11% decaying by β^+ emission. The K/β^+ ratio was shown to be ≈ 7, a value that is about an order of magnitude too high for the decay energy involved. This anomaly is unexplained. The energies and intensities of eight γ rays were measured. A 5-min isomer of ^{131}Ce was also found, but its decay mode could not be established unambiguously. Some information on the γ rays of 59-min ^{131}La is also presented. (auth)

38049 POLARIZATION IN THE ELASTIC SCATTERING OF 49-Mev PROTONS BY Ca, ^{58}Ni, ^{60}Ni, AND ^{208}Pb. Craig, R. M.; Dore, J. C.; Lowe, J.; Watson, D. L. (Univ. of Birmingham, Eng.). Nucl. Phys., 86: 113-18(1966).

Angular distributions are presented of the polarization produced in the elastic scattering of 49-Mev protons in the angular range 20–120° (lab). Results for Ca, ^{58}Ni, ^{60}Ni, and ^{208}Pb show the characteristic oscillations well known at lower energies, but exhibit higher maximum polarizations in general. The technique used involved the single scattering of a 49-Mev polarized beam. (auth)

38050 CROSS SECTIONS AS A FUNCTION OF ENERGY FOR THE SCATTERING OF PROTONS FROM ^{12}C. Swint, J. B.; Barnard, A. C. L.; Clegg, T. B.; Weil, J. L. (Rice Univ., Houston, Tex.). Nucl. Phys., 86: 119-29 (1966). (TID–22348).

The scattering of protons from carbon in the range of incident energies 4.7 to 12.8 Mev was investigated using a tandem Van de Graaff accelerator and a differentially pumped gas scattering chamber. Absolute differential cross sections for elastic scattering and for the inelastic scattering reactions $^{12}C(p,p')^{12}C^*$ (Q = −4.43 Mev) and $^{12}C(p,p'')^{12}C^*$ (Q = −7.66 Mev) were measured at laboratory angles of 25.54, 85.22, 105.23, 121.16, 137.52 and 159.45° as a function of energy in steps of 2.5 to 20 kev. Of particular interest is the splitting of the known resonance at 9.14 Mev, indicating a previously unknown level. (auth)

38051 CROSS SECTIONS AS A FUNCTION OF ANGLE AND COMPLEX PHASE SHIFTS FOR THE SCATTERING OF PROTONS FROM ^{12}C. Barnard, A. C. L.; Swint, J. B.; Clegg, T. B. (Rice Univ., Houston, Tex.). Nucl. Phys., 86: 130-44(1966). (TID–22346).

Absolute differential cross sections as a function of angle for the elastic scattering of protons by ^{12}C, and for the reactions which occur, were measured at incident proton energies E_p = 2.39, 2.97, 3.97, 4.99, 5.66, 6.18, 6.65, 6.77, 8.07, 8.39, 8.96, 9.39, 9.81 and 11.60 Mev. Complex phase shifts were obtained to represent the elastic scattering cross sections, the total inelastic cross sections and certain polarization data. The phase-shift values at the above discrete energies were used to estimate a continuous energy dependence for the phase shifts in the range $5.0 \leqq E_p \leqq 9.5$ Mev, omitting the rapid energy variation due to narrow levels. The estimates were varied slightly to obtain a good fit (except over the narrow levels) to the previously reported cross sections as a continuous function of energy. Finally the narrow levels were included in a calculation of the differential elastic scattering cross section and the polarization at $\theta_{lab} = 50°$, all as a continuous function of energy. The calculation adequately reproduced the experimental data through most of the energy range. Only one of the states close to E_p = 9.14 Mev was included in the calculations, so that the results differed significantly from the experimental values above E_p = 8.5 Mev. (auth)

38052 REACTION (t,p) WITH THE EVEN ISOTOPES OF Sm. Bjerregaard, J. H. (Univ., Copenhagen); Hansen, Ole; Nathan, O.; Hinds, S. Nucl. Phys., 86: 145-66(1966).

The (t,p) reactions on the even isotopes of Sm were investigated at a bombarding energy of 12 Mev with the purpose of exploring the transition from spherical to deformed nuclei. The reaction protons were detected in the Aldermaston multi-angle spectrograph, the overall energy resolution being about 20 kev full width at half maximum. Levels in ^{148}Sm, ^{150}Sm, ^{152}Sm, ^{154}Sm, and ^{156}Sm were established below 2–3 Mev excitation energy. A number of 0^+ and 2^+ states were identified from the proton angular distribution data. The 0^+ energies (±10 kev) and maximum differential cross sections in mb/sr (±25%) were: ^{148}Sm g.s. (0.29), 2.611 Mev (0.09); ^{150}Sm g.s. (0.57), 0.745 Mev (0.14); ^{152}Sm g.s. (0.19), 0.685 Mev (0.14), 1.091 Mev (0.13); ^{154}Sm g.s. (0.30), 1.117 Mev (0.03), 1.218 Mev (0.10); ^{156}Sm g.s. (0.30), 1.068 Mev (0.02). (auth)

38053 MEASUREMENT OF (p,n) THRESHOLDS AT TANDEM ENERGIES. Rickards, G.; Bonner, B. E.; Phillips, G. C. (Rice Univ., Houston, Tex.). Nucl. Phys., 86: 167-86(1966). (TID–22818).

The "counter ratio" technique of Bonner for measuring neutron thresholds was extended to bombarding energies greater than 6 Mev. Neutron background problems had previously precluded neutron threshold measurements with this technique at these energies. A system was developed which allowed the beam to be stopped 9.14 m from the thin foil target in a heavily shielded cave. No slits were used other than those of the analyzing magnet, and they were shielded from the experimental area. A remotely rectractable plunger permitted accurate alignment of the beam by minimizing the beam current on a Ta disk with a 4.7 mm aperture. The slow counter consisted of 2 BF_3 tubes imbedded in paraffin through which the beam passed. Improvement in background by a factor of 5 or better over stopping the beam in a ^{58}Ni slug at the target was achieved. Thresholds were measured for various (p,n) reactions, and the results are given as follows according to the reaction (level in residual nucleus) threshold energy in Mev: $^{13}C(p,n)^{13}N(0)$ 3.235, (2)6.965; $^{27}Al(p,n)^{27}Si(0)5.800$, (1) 6.611, (2) 6.793, (3) 8.046, (4) 8.549; $^{52}Cr(p,n)^{52}Mn$ (1) 5.975, (2) 6.149; $^{58}Ni(p,n)^{58}Cu$ (0) 9.509; $^{60}Ni(p,n)^{60}Cu$ (0) 7.025, (1) 7.092, (2) 7.325; $^{62}Ni(p,n)^{62}Cu$ (0) 4.812, (1) 4.852, (2) 5.109. Many resonances were observed in the various compound nuclei. (auth)

38054 ABSOLUTE ENERGY CALIBRATION OF NEUTRON THRESHOLDS. Bonner, B. E.; Rickards, G.; Bernard, D. L.; Phillips, G. C. (Rice Univ., Houston, Tex.). Nucl. Phys., 86: 187-92(1966). (TID–22778).

A recently developed low-background system for mea-

suring neutron threshold energies above 5 Mev was used in conjunction with a 180° annular magnetic spectrometer to perform absolute measurements of four neutron threshold energies covering the energy range from 3 to 9.5 Mev. The reactions and the corresponding threshold energy are as follows: $^{13}C(p,n)^{13}N$, 3.2354 ± 0.0024 Mev; $^{27}Al(p,n)^{27}Si$, 5.7943 ± 0.0047 Mev; $^{60}Ni(p,n)^{60}Cu$, 7.0236 ± 0.0071 Mev; $^{58}Ni(p,n)^{58}Cu$, 9.5160 ± 0.0078 Mev. A comprehensive tabulation of the absolute measurements performed in this laboratory during the past several years is given. (auth)

38055 PHOTON SCATTERING BY ORIENTED NUCLEI. Arenhoevel, Hartmuth; Greiner, Walter (Univ., Frankfurt am Main). Nucl. Phys., 86: 193-207(1966).

The general formalism of photon scattering by oriented nuclei is developed for electric dipole and electric quadrupole radiation. The differential scattering cross section can be expanded in terms of the orientation parameters f_ν, the coefficients of which contain the interference of the different polarizabilities. Explicit formulas are given for dipole radiation. The photon scattering by aligned ^{165}Ho nuclei is discussed in detail in the framework of the dynamic collective model showing the importance of the scalar-tensor polarizability interference for direct observation of the optical anisotropy of nuclei. (auth)

38056 EFFECT OF A SHORT-RANGE NEUTRON-PROTON INTERACTION ON THE PAIRING MODEL. Hamamoto, Ikuko (Tokyo Univ.). Nucl. Phys., 86: 208-24(1966).

The effect of a short-range, neutron-proton interaction on the pairing model is investigated. The change of the single-particle energy levels due to the neutron-proton interaction is estimated. The calculated energies of one-quasi-particle states are compared with the observed energy spectra of odd-mass nuclei. Then, calculation by the Tamm-Dancoff approximation is carried out and the wave functions thus obtained are discussed. Especially, the low-lying level scheme in antimony and iodine isotopes is explained by the neutron-proton interaction. (auth)

38057 COULOMB FORM FACTORS OF ^{10}B AND ^{11}B. Stovall, T.; Goldemberg, J.; Isabelle, D. B. (Ecole Normale Superieure, Orsay, France). Nucl. Phys., 86: 225-40(1966).

The electron scattering cross section of ^{10}B and ^{11}B was measured at incident energies of 198.5, 333 and 400 Mev for various scattering angles. The data were analyzed so as to yield values of the mean square charge radius and the nuclear quadrupole moment. Several nuclear models are considered. (auth)

38058 MEASUREMENT AND ANALYSIS OF MUONIC X-RAY SPECTRA IN SPHERICAL NUCLEI. Acker, H. L. (Univ., Freiburg i. B.); Backenstoss, G.; Daum, C.; Sens, J. C.; De Wit, S. A. Nucl. Phys., 87: 1-50(1966).

Muonic x-ray spectra for 18 elements with spherical nuclei between Cl and Bi and a sample of ^{206}Pb were investigated. The x-ray transition energies were measured with a Ge Li-drifted detector. The $2p \rightarrow 1s$ transitions were observed for all elements, $3d \rightarrow 2p$- and $4f \rightarrow 3d$-transitions for all elements with $Z \geqq 50$, $5g \rightarrow 4f$ transitions for elements with $Z \leqq 57$, and for some of the heaviest elements ($Z \geqq 79$) higher transitions up to $7i \rightarrow 6h$ were measured. The charge distribution of the nucleus can be determined by the energy of the $2p \rightarrow 1s$ and the $3d \rightarrow 2p$ transitions. The data were analyzed in terms of a two-parametric charge distribution of the Fermi type by solving the Dirac equation numerically. Vacuum polarization effects are included and are checked by comparison with the data on higher transitions. In heavy elements the radial parameter c and the surface thickness t are determined, whereas light and medium Z elements only one parameter can be measured with sufficient accuracy. In Au, Pb and Bi the values for c are slightly higher, for t lower than the results of electron scattering experiments. In Ca and Sb, the $2p \rightarrow 1s$ transitions yield good agreement with electron scattering data. The systematic features of the x-ray data show consistency with a model of constant t = 2.21 fm and constant nucleon density $\rho_n = 0.158\ fm^{-3}$, slightly lower than those obtained from electron scattering by Elton. Relative intensities in the $2p \rightarrow 1s$ spectra and in the $3d \rightarrow 2p$ spectra show deviations from a statistical population of the states for the high-Z elements and for some of the medium-Z nuclei. Hyperfine structure and isotope effects cause observable broadening of the line in the spectra of I, Nd, Au and Bi. Nuclear polarization effects were estimated to be smaller than the experimental error. A number of capture γ-rays was observed, the measurement of which yields an improved energy determination of the levels in ^{120}Sn, ^{122}Sn and ^{138}Ba. In the course of the calibration of the system, values for some γ lines in ^{66}Ga were determined. (auth)

38059 EXCHANGE CURRENT AND DEUTERON PHOTODISINTEGRATION AT THRESHOLD. Kaschluhn, F.; Lewin, K. (Humboldt Univ., Berlin. Deutsche Akademie der Wissenschaften, Berlin). Nucl. Phys., 87: 73-82 (1966).

The contribution from the meson exchange current to the deuteron photodisintegration amplitude at threshold is calculated by taking into account the next nearby singularities beyond the nucleon exchange poles in the crossed channels. The procedure is based on potential theory. Starting with the corresponding fourth-order Feynman amplitude with the deuteron-nucleon vertex on the mass shell, a local "exchange potential" is derived. Its contribution to the amplitude is calculated by using the Hulthén function for the initial deuteron state (thus including the off-mass shell properties of the deuteron-nucleon vertex) and the effective range approximation for the final scattering state. The result is combined with the direct γ-nucleon contribution calculated by Austern and Rost and agrees with experiment within the limits of error. (auth)

38060 STATISTICAL ANALYSIS OF THE INTERACTION OF 17 Gev MESONS WITH PHOTOEMULSION HEAVY NUCLEI. Artykov, I. Z.; Barashenkov, V. S.; Eliseev, S. M. (Joint Inst. for Nuclear Research, Dubna, USSR). Nucl. Phys., 87: 83-7(1966).

The Monte-Carlo method was used to calculate several hundred internuclear cascades initiated in the Ag and Br nuclei by 17-Bev mesons (π^-). The results of the calculations agree well with some experimental data. (auth)

38061 ON THE RIGIDITY PARAMETERS OF THE OCTUPOLE VIBRATIONS IN ^{19}F. Zaikin, D. A. (Lebedev Physical Inst., Moscow). Phys. Lett., 22: 158-9(Aug. 1, 1966).

The ratio of the rigidity parameters for the axial and nonaxial vibrations in ^{19}F is calculated using experimental data on the inelastic scattering of high-energy protons. (auth)

38062 THE 1505 kev RESONANCE IN $^{29}Si(p,\gamma)^{30}P$ AND PROPERTIES OF ^{30}P LEVELS. Harris, G. I.; Hyder, A. K. Jr. (Aerospace Research Labs., Wright-Patterson AFB, Ohio). Phys. Lett., 22: 159-61(Aug. 1, 1966).

Angular-correlation and polarization measurements at the E_p = 1505-kev resonance in $^{29}Si(p,\gamma)^{30}P$ yield the ^{30}P level assignments 0.71 (1^+), 1.45 (2^+), 1.97 (3^+), 2.54 (3^+), 4.23 (4^-), 4.63 (3^-), 4.93 (3^-), and 7.04 (4^-). The 4^- resonance is probably a $(2s_{1/2}, 1f_{7/2})$, T = 1 analog state. (auth)

38063 THE (t,p) AND (t,α) REACTIONS ON ^{48}Ca AND ^{50}Ti. Williams, D. C.; Knight, J. D.; Leland, W. T. (Los Alamos Scientific Lab., N. Mex.). Phys. Lett., 22: 162-4 (Aug. 1, 1966). (LA-DC-7991)

Ground-state masses and low-lying excited states are reported for ^{50}Ca, ^{52}Ti, ^{47}K, and ^{49}Sc, as observed in the reaction of 7.5-Mev tritons and alpha particles with ^{48}Ca and ^{50}Ti. (auth)

38064 RADIATIVE PION ABSORPTION IN COMPLEX NUCLEI. Anderson, D. K.; Eisenberg, J. M. (Univ. of Virginia, Charlottesville). Phys. Lett., 22: 164-6(Aug. 1, 1966). (ORO-2915-60).

It is shown that radiative absorption of pions may be used to study spin-isospin modes of excitation in nuclei. (auth)

38065 SPIN MEASUREMENT AND ISOSPIN IMPURITY OF THE ^{64}Ga GROUND STATE. Deutsch, J. P.; Grenacs,

NOTICE

A title page for Volume 20, Numbers 19–24, is included at the back of this issue for use in binding the fourth quarter of this volume.

CORRECTIONS

NSA Vol. 17, No. 3, Abst No. 3060, line 5 ... Should read ... U. S. Patent 3,063,829. Nov. 13, 1962.

NSA Vol. 19, No. 20, Abst. No. 38867, line 2 ... Should read ... TIONS. Kalitiuk, Ryszard. Przeglad Geol., 13: 208-13

NSA Vol. 20, No. 13, Abst. No. 24787, line 1 ... Should read ... (BNWL-SA-557) PLUTONIUM RECYCLE

NSA Vol. 20, No. 17, Abst. No. 32645, line 4 ... Should read ... (CONF-651126-18). ORAU. Gmelin, AED-CONF-65-353-

Volume 20, Number 24, December 31, 1966

NUCLEAR SCIENCE ABSTRACTS

A semimonthly publication of the USAEC Division of Technical Information, Edward J. Brunenkant, Director. Published by the USAEC Division of Technical Information Extension, Robert L. Shannon, Extension Manager.

Nuclear Science Abstracts covers the international literature on nuclear science and technology and provides the only comprehensive abstracting and indexing of this body of information. Published twice each month since 1947, *NSA* covers technical reports of the U. S. Atomic Energy Commission and its contractors, technical reports of U. S. Government agencies and other governments, universities, industrial and research organizations, as well as patents, books, and journal literature on a world-wide basis. Nearly 350,000 abstracts have appeared in *NSA* through Volume 19. The subject matter covered in *NSA* is described in issue Number 1 and in TID-4552, *Subject Scope of Nuclear Science Abstracts*, available free from the U. S. Atomic Energy Commission, Division of Technical Information Extension, P. O. Box 62, Oak Ridge, Tennessee 37830.

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Volume 20, Number 24 December 31, 1966

NUCLEAR SCIENCE ABSTRACTS

BIOLOGY AND MEDICINE

General

Refer also to abstract 45397.

45246 (COO-119-234, pp 120-79) BIOASSAY OF RESPONSES OF GROWING BONES TO CORTISOL. Jee, Webster S. S.; Blackwood, Edward L.; Dockum, Norman L.; Haslam, Robert K.; Kincl, Fred A. (Utah Univ., Salt Lake City. Radiobiology Div.).

Progress is reported on a long range program designed to establish quantitative procedures for assessment of comparative potencies and structural activity relations of steroids known to effect changes in mineralized tissues. The bioassay of the responses of distal femur, femoral shaft, and calvaria from growing rabbits fed normal or rachitogenic diet to 15 daily injections of graded doses of cortisol was investigated by contact microradiography and quantitative histology, and analyzed by computing indices of precision (lambda values). The relation of cell population to quantity of cortical and cancellous bone as well as the findings of this report to the published findings in patients after long term administration of adrenal cortical hormones are discussed. (C.H.)

45247 (COO-119-234, pp 211-26) THE RELATIONSHIP OF BONE STRENGTH AND BONE QUANTITY IN HEALTH, DISEASE, AND AGING. Bartley, M. H.; Arnold, J. S.; Haslam, R. K.; Jee, W. S. S. (Utah Univ., Salt Lake City. Radiobiology Div.).

A correlation between the ash content and crushing strength of bone was found in a study of human vertebral bodies. Grams of ash/cc of fresh bone and bone crushing determinations were carried out on adjacent lumbar vertebral bodies. Radiographs were used to ensure uniformity of sample. A high correlation (0.88) was found between crushing strength and the ash content of the adjacent vertebral body. The range of crushing strength values was from 89 lb/in.^{2} to 852 lb/in.^{2} and the range of ash/cc was from 0.06 g/cc to 0.23 g/cc. (auth)

45248 (NYO-2043-129) THE APPLICATION OF NUCLEAR ENERGY TO AGRICULTURE. Annual Report. Moh, Carl C. (Inter-American Inst. of Agricultural Sciences, Turrialba (Costa Rica)). July 1, 1966. Contract AT(30-1)-2043. 115p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Progress is reported on studies of the γ radiosensitivity of tropical plant species, metabolism in anthracnose fungi, the use of γ radiation for the eradication of insect pests indigenous in tropical regions, and the chemistry of tropical soils. Data are included from studies on the γ radiosensitivity of Pinus montezumae and Theobroma (cacao) trees and of 7 species of Phaseolus (beans); the mutation frequency in beans exposed to chronic γ irradiation during the whole life cycle; the effects of low temperature on growth of bean seedlings; genetic studies of Manihot esculenta; γ radioinduced mutants of Neurospora crassa; and the metabolism of amino acids and carbohydrates in the tropical anthracnose fungi, Gloeosporium musarum and Colletotrichum gloeosporioides. Applications of γ radiation in the eradication of the Mediterranean fruit fly, Ceratitis capitata, the tropical warble fly, Dermatobia hominis, and the coffee leaf miner, Leucoptera coffeella. Extensive biological studies of these insects are reported. Results are reported from studies on the chemical properties and effects of fertilizers on tropical soils of recent volcanic ash origin. The movement of ^{32}P-phosphates from parasitic plants to host plants, and vice-versa, was studied after root and foliar application. A list is included of publications during the period covered by this report. (C.H.)

45249 (UCLA-12-595) SEMIANNUAL PROGRESS REPORT FOR THE PERIOD ENDING JUNE 30, 1966. (California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology). Contract AT(04-1)-Gen-12. 104p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Separate abstracts were prepared on six sections of this report. A list is included of 57 papers published during the period covered (January 1, 1966, through June 30, 1966). (H.L.W.)

For abstracts of individual sections see: 45264, 45289–45291, 45322, and 45511.

45250 ETIOLOGY OF LEUKEMIA: A REVIEW. Shafer, A. William (Scripps Clinic and Research Foundation, La Jolla, Calif.). Calif. Med., 104: 161-5(Mar. 1966).

The possible role of ionizing radiation, chemical agents, and viruses in the causation of leukemia is considered. It seems likely that there are multiple causative factors involved in different cases, and that this is true in individual cases. Chromosomal abnormalities that have been found in acute leukemia are either primary and causal or secondary, but contributory. The evidence that radiation may be leukemogenic is conflicting. Extensive studies of patients with spondylitis who were treated with x ray showed many cases of leukemia. Almost all the cases of leukemia occurred in those who had received over 500 R to the spinal column, and there is a linear relation between dose and incidence of leukemia in the mid-dose ranges. Increased incidence of leukemia has been noted in children who have had x-ray therapy to the thymus. Mortality from leukemia may be 40% higher in children exposed in utero. Studies of American radiologists show a greater mortality from leukemia than other medical specialists. Information concerning radiation leukemogenesis collected by the Atomic Bomb Casualty Commission in Japan has revealed an increased incidence of leukemia in the people exposed to more than 50 rad, with a linear relation between dose and incidence of leukemia in those exposed to between 100 and 500 rad. There is no question that large doses of radiation can be leukemogenic but the risk from smaller amounts of irradiation is unknown. No studies to date have revealed evidence of leukemogenesis from diagnostic radiation. (TSS)

45251 VARIOUS ASPECTS OF INTERVENING CELLS IN ANTIBODY PRODUCTION. Seman, G.; Tenenbaum, R.; Choquet, C.; Mathe, G. (Hopital Paul-Brousse, Villejuif, France). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 83-94(1965). (In French).

For a long time the entire responsibility for the production of antibodies was attributed to the plasmocyte. At present it is the lymphocyte that has been given the place of honor and one tends to forget the plasmocyte. A critical analysis is made of the arguments on which certain concepts have been based, and the results of personal experiments are analysed that would appear to exclude the single part played by the lymphocytes in the production of antibodies. It is suggested to restore the wandering macrophage, the histiomonocyte, from oblivion, for various reasons: a) a number of histiomonocytes are to be found in the lymphoid tissue during immunoreactions, such as the graft reactions; b) these cells may contain immunoglobulins; c) these cells that form the major part of the centers of the lymph nodes, centers that are not normally found present in the thymus but which occur during certain reactions in which they seem to play a part in the production of antibodies; d) the thymic cells appear to be 100 times less active immunologically than lymph node cells, whereas, approximately 10 to 100 times less histiomonocytes are to be found in thymus smears than in lymph node smears; e) the adding of macrophages to thymocytes rise their reactivity. The part played and the exact position of the histiomonocytes with regard to the production of antibodies are discussed in the light of these different points and with reference to recent publications concerning the lymphoid islets observed in tissue cultures and the possible transferring of macrophage RNA to the lymphocytes. (auth)

45252 STUDIES ON THE MECHANISM OF ACTION OF RILEY VIRUS. I. ACTION OF SUBSTANCES AFFECTING THE RETICULOENDOTHELIAL SYSTEM ON PLASMA ENZYME LEVELS IN MICE. Bahy, B. W. J. (Univ. of Cambridge, Eng.); Rowson, K. E. K.; Parr, C. W.; Salaman, M. H. J. Exp. Med., 122: 967-81(Nov. 1, 1965).

Plasma lactic dehydrogenase (LDH) levels were determined in normal and Riley virus-infected mice following treatment with x rays, ThO_2, and other agents known to alter the activity of the reticuloendothelial system (RES). The rise in plasma LDH level after Riley virus infection was considerably enhanced by previous treatment with Thorotrast (to produce blockade of the RES), and decreased by previous treatment with stilbestrol (to stimulate the RES). A dose of 2000 R of whole-body x irradiation, lethal within 3 to 4 days, did not alter the phagocytic activity of the RES, and was without effect on plasma LDH activity in normal mice, or on the rise in plasma LDH level following infection with Riley virus. Blockade of the RES with cholesterol oleate, Thorotrast, or zymosan resulted in a 2- to 3-fold rise in plasma LDH level within a few hours. The level returned to normal by 1 to 3 days. Stimulation of the RES with stilbestrol resulted in a decrease in plasma LDH level by 1 to 2 days in both normal and infected mice, with a return to normal by about a week. Blockage of the RES in uninfected mice with Thorotrast or cholesterol oleate, besides increasing the plasma LDH level, caused a rise in plasma phosphoglucose isomerase level, but no significant alterations in plasma aldolase or alanine transaminase levels, studied up to 10 days. Riley virus causes a similar pattern of enzyme elevation. It is suggested that the increased levels of certain plasma enzymes in Riley virus-infected mice may be due to competitive inhibition by virus particles of plasma enzyme clearance by the RES. (BBB)

45253 STUDIES ON THE MECHANISM OF ACTION OF RILEY VIRUS. II. ACTION OF SUBSTANCES AFFECTING THE RETICULOENDOTHELIAL SYSTEM ON THE LEVEL OF VIRAEMIA. Rowson, K. E. K. (London Hospital Medical Coll.); Mahy, B. W. J.; Salaman, M. H. J. Exp. Med., 122: 983-92(Nov. 1, 1965).

This study was undertaken to determine whether ThO_2 and other agents which affect the activity of the reticuloendothelial system (RES) alter the titer of circulating virus, which is a remarkably constant feature of Riley virus infection. Neither blockade of the RES with Thorotrast, zymosan, or carbon, nor stimulation of the RES with stilbestrol or zymosan, before the injection of Riley virus, produced any observable alteration in the level of viremia attained 24 hr after infection. However, 10 days or more after infection with Riley virus, blockade of the RES with Thorotrast caused a transitory rise. Thorotrast was given as a single intraperitoneal injection in a dose of either 1.0 ml or 0.5 ml per mouse. The blood virus titer rose 24 hr after Thorotrast administration. The small dose produced a 10-fold rise and the larger dose a more than 100-fold rise. In the latter case the effect lasted for at least 48 hr. Stimulation of the RES with stilbestrol caused a slight but prolonged fall in the level of viremia. Zymosan injection at this period of infection caused an initial rise, followed by a fall, in the level of viremia; these changes correlated with the initial period of blockade and the subsequent period of stimulation of the RES observed in carbon clearance studies. The clearance of injected Riley virus particles from the plasma over a period of 3 hours after injection was measured in previously uninfected mice and mice which had been infected with Riley virus for 3 weeks. The mice which had been infected 3 weeks before the test cleared rather more of the injected virus than the previously uninfected mice. Although the activity of the RES affects, and may determine, the level of viremia, the permanence of the viremia in Riley virus-infected mice does not appear to be due to a failure of the RES to clear virus particles from the plasma. (BBB)

45254 ENDOCRINE FUNCTION (THYROID, ADRENAL CORTEX, AND PARATHYROID) IN THE ATOMIC BOMB SURVIVORS. Tezuka, Hiroshi (Nagasaki Univ. School of Medicine). Nagasaki Igakkai Zasshi, 40: 13-29(Jan. 1965). (In Japanese).

Endocrine function was examined in 70 atomic bomb survivors. To estimate the early effects of irradiation, experiments were performed in which rabbits received whole-body x irradiation; some of them received a thermal burn at the same time, and their endocrine function was examined over the following six months. Disturbances of endocrine function were evident in some of the atomic bomb survivors 13 years after the explosion. The thyroid function was slightly increased but that of the parathyroid and the adrenal cortex was depressed to below normal levels. The degree of the endocrine disturbances was most marked in the survivors with keloids; it was milder in those with hypertrophic scars and minimal in the cases with atrophic or wound scars. Survivors with no scars or keloids who were exposed within 2 km from the hypocenter showed a moderate degree of disturbances in endocrine functions. After making experimental thermal burns of 12.56 cm^2 area on the back of rabbits, their basal metabolic rate (BMR), urinary 17-ketosteroid, and Ca/P blood levels were measured. Immediately after exposure all these values rose abruptly, but 1 to 2 months later all values returned to normal. After whole-body irradiation of 500 R, BMR fell temporarily, but after one month it began to rise above normal and after 6 months it showed 28% higher value than normal. Urinary 17-ketosteroids decreased markedly after irradiation, and after 3 weeks began to increase gradually; it showed 20% lower value than normal even after six months. The changes of Ca/P in serum showed same pattern as that of urinary 17-ketosteroids, and after six months it was 15% lower value than normal. After whole-body irradiation with 500 R, some rabbits also received thermal burns, and their disturbances of endocrine function were more severe. That is, the function of the thyroid was elevated and the function of the parathyroid and adrenal cortex markedly reduced. It is concluded that a close relation exists between the atomic bomb-induced keloids and disturbances in the endocrine functions caused by the irradiation. (TSS)

45255 EFFECT OF LIGHT AND DARKNESS ON SOME ORGANIC COMPOUNDS IN LEMNA PERPUSILLA. Chen, Ching-san; Miyano, Masateru (Tokyo Univ.). Nippon Nogeikagaku Kaishi, 40: 161-4(Mar. 1966). (In Japanese).

Lemna perpusilla was exposed to $^{14}CO_2$ under continuous

illumination or short-day conditions. Concentrations of citric acid, malic acid, aspartic acid, asparagine and glutamine varied with illumination. Citric acid and aspartic acid were accumulated under short-day conditions, while malic acid and glutamine were decreased. When the photoperiod was changed from continuous illumination to short-day condition, asparagine was increased at the beginning of short-day condition and was decreased after flowering. (TSAT)

45256 DEPARTMENT OF RADIATION BIOLOGY. Takeshita, Kenji; Antoku, Shigetoshi; Yamamoto, Osamu; Sawada, Shozo; Kijima, Teruzo. Proc. Res. Inst. Nucl. Med. Biol., No. 7, 125-8(1966).

Four main studies were instituted to analyze the mechanism of biological effects produced in tissue by x rays, ^{60}Co γ rays, and 14.1 Mev neutrons. In studies of radiation effects in frog eggs concerning sex ratio and abnormal gonad histology, survival curves were determined for embryos from data on irradiated eggs, fertilized eggs, and sperm. Studies of mice for lethal effects when exposed to mixed radiations of neutrons and ^{60}Co γ rays, or x rays were conducted to clarify the mechanisms of biological actions of radiations similar to those of the atomic bombs, particularly neutrons. Medical x-ray exposure was surveyed with emphasis on radiodiagnosis. Surveys were made of patient exposure and of hospitals and clinics for technical parameters in examinations. The latter were determined by fundamental and detailed dosimetry using a human phantom. Other problems studied were: spectrometry of scattered x rays as they contribute to short distance radiography and dose distribution of therapeutic ^{60}Co γ rays in tangential, rotational; and other types of radiotherapy. Mechanisms of effects in tissues immediately following energy absorption, and effects of chemical protective agents, especially AET, were investigated. (H.G.D.)

45257 IONIZIRUYUSHCHIE IZLUCHENIYA V BIOLOGII. (Ionizing Radiation in Biology). Ozol, A. M. Riga, Izdatel'stvo Zinatne, 1965. 155p.

A series of 19 articles on the effects of ionizing radiation on biological materials are compiled. The topics discussed are general aspects of radiobiology, use of small doses of γ rays, radiation mutagenesis, and radiation sterilization of animal pests and insects. (J.S.R.)

Ecology

Refer also to abstract 45962.

45258 (IAEA–2607-12) ECOLOGY OF ACANTHARIA IN RELATION TO Sr CIRCULATION IN THE SEA. Progress Report, December 1, 1965–August 31, 1966. Schreiber, Bruno (Parma Univ. (Italy). Istituto di Zoologia e Anatomia Comparata). Contract AT(30-1)-2607. 32p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Taxonomic studies have been made on collections from the Gulf Stream and the Sargasso Sea. Forty species of Acantharia (Protozoa: Radiolaria) have been determined. The radioactivity of ^{90}Sr of plankton in relation to the presence or absence of Acantharia has been studied. Strontium-90 from fallout has been increasing since 1958; however, it is also being diluted by the large quantity of water in the oceans. Radiochemical analyses for ^{90}Sr have been made on plankton samples from the Ligurian and Adriatic Seas. Acantharia are present in the Ligurian Sea, but absent in the Adriatic; this appears to be related to a difference in accumulation capacity of ^{90}Sr. Coastal marine sediments were analyzed for beta activity; a higher radioactivity was found in surface layers. Values for 1966 are lower than those of previous years indicating a decay of nuclides. Determinations were made on ^{226}Ra, ^{230}Th, ^{232}Th, ^{235}U, ^{238}U, ^{90}Sr, ^{144}Ce, ^{147}Pm, and ^{155}Eu. The ratio of ^{144}Ce: ^{147}Pm or ^{155}Eu: ^{147}Pm is an indication of the rate of coastal sedimentation. Methods of collecting and identifying Foraminifera in Adriatic sediments are described; micropalaeontology studies are being made. Granulometric and diffractometric analyses on Ligurian sediments show the presence of muds and clay materials, illite and ferriferous chlorite. Research in progress consists of culture techniques for cysts of Acantharia and radiochemical analyses of coastal sediments for ^{90}Sr, ^{144}Ce, and ^{155}Eu. (H.L.W.)

45259 (NYO–2577-3) A STUDY OF NATURAL RADIOACTIVITY IN BRAZIL. Roser, Francisco Xavier (Pontificia Universidade Catolica do Rio de Janeiro (Brazil)). July 31, 1966. Contract AT(30-1)-2577. 101p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

The hard slope of the mountain, Morro Do Ferro, contains strong concentrations of thorium and traces of uranium. Only poor quality grass grows on this slope; at the foot of the mountain there is a forest which is rich in vegetation. A radiochemical assay was made of the soils and plants in the forest area. Radiochemical measurements of radium-226, radium-228 and thorium-228 in the soil were made. An analysis of radium-224 was made by gamma spectroscopy. These isotopes were found in high concentrations in comparison with normal soils. Plants of the following families were analyzed for radioactivity: Melastomataceae, Rubiaceae, Clethraceae, Mirtaceae, Lauraceae. High concentrations of radium-226, radium-228 and thorium-228 were found in all of them. Gamma spectroscopy analyses were made of soils and grass from the hard slope of the mountain. A strong correlation was found between the radioactivity in the soils and grass. In the region of the towns of Araxa and Tapira there is a large area of natural radioactivity. The soil contains a large amount of thorium and uranium. Gamma analyses were made on the soil and the plant, manioc, a root vegetable consumed locally in large quantities. Little correlation was found between the soil and manioc. A very high level of radioactivity is found in the environment of the town of Guarapari; a high content of thorium and uranium is found in the monazite sand. A cytogenetic study of the people revealed many chromosome aberrations. Thermoluminescent dosimeters were used to measure external levels of radioactivity. Internal contamination by breath analysis and whole-body counting studies were made. The results indicate that a large part of the population have body burdens of the order of one nanocurie of radium-224. (H.L.W.)

45260 (RLO–1750-8(Vol.2)) ECOLOGICAL STUDIES OF RADIOACTIVITY IN THE COLUMBIA RIVER ESTUARY AND ADJACENT PACIFIC OCEAN. Progress Report, July 1, 1965–June 30, 1966. McCauley, James E. (comp. and ed.) (Oregon State Univ., Corvallis. Dept. of Oceanography). Contract AT(45-1)-1750. 138p. Dep. mn. CFSTI $4.00 cy, $1.00 mn.

Separate abstracts were prepared on two papers included in this report. (C.H.)

For abstracts of individual papers see: 45261 and 45890.

45261 (RLO–1750-8(Vol.2), (Paper 1)) RETENTION OF ^{65}Zn BY COLUMBIA RIVER SEDIMENT. Johnson, Vernon Gene (Oregon State Univ., Corvallis. Dept. of Oceanography). 56p.

Thesis.

The relative importance of ion-exchange and specific sorption as mechanisms of retention of ^{65}Zn by Columbia River sediment were investigated using an elution technique. The exchangeable ^{65}Zn fraction and the effect of sea water per se on sediment sorbed γ emitters were determined simultaneously by elution with synthetic sea water in the field immediately upon collection of the samples, using a portable lab designed especially for this study. Specifically sorbed ^{65}Zn was determined by elution with a dilute solution of copper sulfate. Less than 5% of the sediment sorbed ^{65}Zn was found to be exchangeable while from 35 to 54% was displaceable with $CuSO_4$. The large amount of copper displaceable ^{65}Zn was shown not to be simply an ion-exchange displacement nor a pH effect, but rather, replacement of ^{65}Zn by Cu II appears to be due to the greater affinity of the latter for the specific sorption sites. (34 references.) (C.H.)

45262 (RLO–1750-8(Vol.3)) ECOLOGICAL STUDIES OF RADIOACTIVITY IN THE COLUMBIA RIVER ESTUARY

AND ADJACENT PACIFIC OCEAN. Progress Report, July 1, 1965–June 30, 1966. McCauley, James E. (comp. and ed.) (Oregon State Univ., Corvallis. Dept. of Oceanography). Contract AT(45-1)-1750. 111p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Separate abstracts were prepared on two papers in this report. (C.H.)

For abstracts of individual papers see: 45263 and 45961.

45263 (RLO–1750-8(Vol.3), (Paper 1)) AN INVESTIGATION OF THE DISTRIBUTION OF NEPHTYS CAECOIDES IN YAQUINA BAY. Morrison, George Edwin (Oregon State Univ., Corvallis. Dept. of Oceanography). 35p.

Thesis.

A study was undertaken in Yaquina Bay, Oregon, during the summer of 1964 to determine the distribution and the factors affecting the distribution of the polychaete worm, Nephtys caecoides, Hartman, 1938, in the estuary. This organism has a continuous distribution from offshore to a point approximately eight kilometers into the bay. Environmental factors considered were salinity, temperature, and sediment composition. The results of this study do not single out a factor as the one limiting the distribution of N. caecoides in Yaquina Bay. During summer months, it is possible that sediment porosity, organic content, and temperature operate together to form an unfavorable environment. (29 references.) (auth)

45264 (UCLA–12-595, pp 72-89) ENVIRONMENTAL RADIATION. (California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology).

Progress is reported in the following studies: Nevada Test Site vascular plant and small mammal inventory; Nevada Test Site environmental measurements; Nevada Test Site vegetation and small mammal studies; radiation effects studies; evaluation of energy production and utilization by the Rock Valley rodent population; life spans of rodents in the Mojave Desert; comparison of radioisotope assimilation by granivorous and herbivorous mammals; field studies of the transfer of cesium-137 from fallout to milk; influence of clinoptilolite on strontium-90 and cesium-137 uptake by bean plants; Project Sedan, Projects 62.86 and 62.80, Part I, characteristics of fallout from a deeply buried nuclear detonation from 7 to 10 miles from Ground Zero; concentration of radionuclides by plants grown on ejecta from the Sedan Thermonuclear Cratering Detonation; Nevada Test Site radioecology and arthropods; γ irradiation of a Puerto Rican forest and its effects on lizards and frogs; chronic low-level γ irradiation and natural populations of lizards; competition among plant species; rooting of stem cuttings of shrubs from the Nevada Test Site; chemical problems. (H.L.W.)

45265 BIOTIC COMMUNITIES OF THE NEVADA TEST SITE. **Allred, Dorald M.; Beck, D. Elden; Jorgensen, Clive D. (Brigham Young Univ., Provo, Utah). Brigham Young Univ. Sci. Bull., Biol. Ser., 2: No. 2, 1-52(Feb. 1963).**

The fauna and predominant animals known to occur at the Nevada Test Site, with designation of ecological distribution and relative density, are listed as the basic faunistic reference source, in subsequent studies, related to geographical and ecological features at the test site. Since the first nuclear detonation at the Site in January, 1951, followed by many weapons and experimental devices, the native plants and animals have been disturbed to varying degrees by the thermal, radiation, and other physical effects of these tests. An ecological survey of the fauna at the Site was initiated to study the effects which these nuclear tests have had on the native animals. Inasmuch as no basic ecological investigations were made at the test site before nuclear testing commenced, studies were designed to develop standards of measurement to determine past nuclear effects, so far as possible, as well as to measure the effects of future tests. Principal objectives of the project were to determine the kinds, population, seasonal occurrence, geographic and ecological distribution, migration, home range, and related habits of native animals in these areas. (C.H.)

45266 IRRADIATION OF NATURAL VEGETATION. AN EXPERIMENTAL FACILITY, PROCEDURES, AND DOSIMETRY. McCormick, J. Frank (North Carolina Univ., Chapel Hill. Georgia Univ., Athens); Golley, Frank B. Health Phys., 12: 1467-74(Oct. 1966).

A portable 9200-C ^{137}Cs radiation source is described which meets the requirements for acute and chronic irradiation of natural plant and animal communities. Irradiation of old field and forest communities has provided an opportunity to test experimental procedures and to compare dose rate distribution in two contrasting ecological systems. Results indicate that in an ecologically and structurally complex community, such as a forest, the pattern of the gamma field is less predictable and more variable along both horizontal and vertical transects than in a less complex system, such as an old field. Although the type of vegetation may greatly influence exposure rates within a short distance of a strong gamma source, at distances beyond 100 m exposure rates are little affected by the type of vegetation through which the radiation has passed. Exposure of glass rod dosimeters to sunlight during irradiation resulted in a 24 percent loss of fluorescence. Dose estimates were corrected accordingly. (auth)

45267 THE ELABORATION OF THE TRANSMISSION METHOD FOR STUDYING THE WATER RELATIONS OF TREES. **Klemm, W. Isotopenpraxis, 2: 262-7(June 1966). (In German).**

In evaluating the total water content of trees under ecological conditions, fundamental methodical difficulties arise because of the size of the objects to be measured. A new technique for characterizing the water content of trees in a more exact way than by using the conventional methods is discussed. The new technique is based on determining the density of the trunk in situ by using the gamma-ray transmission technique to find the daily variations in the water content of the trunk. The principle of measurement often used in industry was applied. The experimental arrays used were described and an example of their use is given. The transmission technique has proved to be well suited for this purpose. The results obtained by using the new technique will be published in a summarized form in a biological periodical. (auth)

Metabolism, Tissue Distribution, and Toxicology

45268 (AD–638991) AN INVESTIGATION OF BIOLOGICAL SYSTEMS BY SLOW NEUTRON INELASTIC SCATTERING. Boutin, H. P. (Feltman Research Labs., Picatinny Arsenal, Dover, N. J.). Sept. 1966. 52p. (PA-TR–3367). CFSTI $3.00 cy, $0.50 mn.

Several systems of biological interest have been investigated by slow neutron inelastic scattering. The frequencies of molecular vibrations in a 40– 800 cm^{-1} range have been obtained for several polypeptides (polyglutamic acid, polyglycine, polyleucine). Under certain approximations, the frequency distribution $g(\nu)$ of phonons in the sample can be extracted from the scattered neutron intensity. This function $g(\nu)$ can in turn be used to calculate some of the thermodynamic parameters such as free energy, enthalpy, or specific heat, C_v. This has been applied to the study of the α-helix-random coil transition in PGA, and to the denaturation of bovine serum albumin (BSA). Preliminary results on the "melting" of keratin structure in 7– 8 M LiBr solution are also presented. (auth)

45269 (AD–639699) POLAR TRANSPORT CHARACTERISTICS OF RADIOSTRONTIUM IN ISOLATED CORN ROOT SEGMENTS. Vaughan, B. E.; Evans III, E. C.; Hutchin, M. E. (Naval Radiological Defense Lab., San Francisco, Calif.). July 11, 1966. 17p. (USNRDL-TR–1047). CFSTI $1.00 cy, $0.50 mn.

Polar transport in isolated segments of Zea Mays root was verified using paired simultaneous tracers for Ca

and Sr. A model has been presented for determining molar transport rates in the root segments by an improved compartmental glassware system. ^{85}Sr transport exactly parallels variation in ^{45}Ca transport. (auth)

45270 (AD-639836) TRANSPORT OF CALCIUM AND STRONTIUM IN THE PRIMARY ROOT OF ZEA MAYS. Hutchin, M. E.; Vaughan, B. E. (Naval Radiological Defense Lab., San Francisco, Calif.). Feb. 28, 1966. 14p. (USNRDL-TR-1039). CFSTI $1.00 cy, $0.50 mn.

Root segments, 55 mm long, were exposed to nutrient containing ^{85}Sr and ^{45}Ca tracers. From 0.25 to 5.0 mM Ca, calcium transport was comparatively unaffected by concentration; but from 0.05 to 0.25 mM, it fell off sharply. The maximum transport of strontium from nutrient containing 0.05 mM Ca was twice that from 2.5 mM Ca, and also twice the maximum calcium transported. Thus, under the condition simulating calcium depletion, i.e., 0.05 mM Ca, greater proportions of strontium were transported. In simultaneous determinations, the ratio of Sr to Ca moved was equal to the ratio of their concentrations in nutrient solution. Dinitrophenol inhibited Ca and Sr movement similarly. (auth)

45271 (AERE-PR-HPM-9, pp 26-31) OPERATIONS GROUP. (Atomic Energy Research Establishment, Harwell (England)).

Results are summarized from aerosol inhalation studies using ^{132}I-methyl iodide as tracer for iodine metabolism. The effectiveness of smears for measuring tritium surface contamination was evaluated and the percutaneous uptake of tritium from metal surfaces was measured. Methods for the radiochemical determination of ^{239}Pu in urine and ^{55}Fe and ^{59}Fe in blood samples were improved. The determination of Pu in biological samples by measurement of short-lived iodine fission products following neutron activation is discussed. The determination of ^{210}Po in urine following deposition on Ni, Ag, or stainless steel discs using solid state counters was investigated. The determination of ^{231}Po in urine using low-background α counters was investigated. The adsorption of α emitters on glass sinters was investigated as a rapid method for the determination of α emitters in urine. Asbestos fibers were labeled by neutron irradiation. Radium-223 in the presence of ^{133}Ba, ^{85}Sr, and ^{47}Ca, was determined in samples of blood and urine by radiochemical and γ spectrometric methods. (C.H.)

45272 (BNL-981) ENDOGENOUS BIOCHEMISTRY OF PLANARIANS CORRELATED WITH LEARNING EXPERIMENTS AT BROOKHAVEN NATIONAL LABORATORY. Freed, Simon (Brookhaven National Lab., Upton, N. Y.). Dec. 1965. Contract AT(30-2)-Gen-16. 21p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The role of RNA in the storage of information during the process of learning in planarians has been studied. The water surrounding the planarians contained phosphorus-32 which was incorporated in the nucleic acid molecules laid down during the training period. The animals were subjected to electric shock and light stimuli. In the control worms the stimuli were applied at random, while in the experimental worms there was a definite time interval between the 2 types of stimuli. This treatment resulted in a conditioning, or learning, of the experimental worms. The changes in the nucleic acids in the conditioned worms were different from the changes in the control worms. The ratios of phosphorus-32 labeled RNA to DNA differed in the control and experimental animals. (H.L.W.)

45273 (BNWL-SA-633) COMPARATIVE DISPOSITION OF FOUR TYPES OF PLUTONIUM DIOXIDES INHALED BY DOGS. Bair, W. J.; Park, J. F. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). Aug. 29, 1966. Contract AT(45-1)-1830. 33p. (CONF-660920-2). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From 1st International Congress of the International Radiation Protection Assn., Rome, Italy.

Groups of three dogs were given single inhalation exposures to dry aerosols of one of four different plutonium dioxides to compare retention, translocation, and rates of excretion. Two of the plutonium dioxides were prepared by calcining the oxalate at 350° and at about 1000°C. Two others were produced by ignition of the stabilized delta metal at 450°C and by slow oxidation of the pure metal at 123°C. The lung retention half-time of the oxalate calcined at 350° was about one year, half that of the other oxides. This was due to greater accumulation of plutonium in the bronchial lymph nodes rather than greater clearance via the mucus-ciliary pathway or a relatively high rate of solubility. The metal oxidized at 450° was cleared via the mucus-ciliary route to a lesser extent than the other oxides. This same oxide also showed a selective loss of ^{241}Am, relative to ^{239}Pu, in lung and bronchial lymph node tissue which was not evidenced by the other oxides. The oxalate calcined at 1000° showed the least translocation to tissues outside the respiratory tract. These results indicate that the physical-chemical state of inhaled plutonium dioxide influences its disposition in the body. (auth)

45274 (BNWL-SA-825) EFFECT OF AGE AND DIET ON EXCRETION OF STRONTIUM AND CALCIUM BY RATS. Thompson, Roy C.; Palmer, Ray F. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). Aug. 18, 1966. Contract AT(45-1)-1830. 20p. (CONF-660920-4). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 1st International Congress of the International Radiation Protection Assn., Rome, Italy.

Mature (8-month old) and growing (26-day old) rats, maintained on diets varying in calcium content from 0.03–2.0 percent were given a single injection of ^{90}Sr and ^{45}Ca and subsequent excretion of these radionuclides, in urine and feces, was measured over a period of sixty days. Similarities and differences in their patterns of excretion are discussed in relation to the probable mechanisms responsible for the behavior noted. Of particular interest was the decrease in ratio of urinary to fecal excretion of both ^{90}Sr and ^{45}Ca as a function of time following injection. This change was more evident for strontium than for calcium, was more evident in the adult than in the growing rat, and was most marked on a high calcium diet. To explain this variation it is hypothesized that strontium and calcium released from firm binding sites in bone may exist in the blood in a different form than strontium and calcium in equilibrium with freely exchangeable sites on bone surfaces. (auth)

45275 (COO-119-234) RESEARCH IN RADIOBIOLOGY. Annual Report of Progress in the Internal Irradiation Program. Dougherty, Thomas F. (Utah Univ., Salt Lake City. Radiobiology Div.). Mar. 31, 1966. Contract AT(11-1)-119. 326p. Dep. mn. CFSTI $7.00 cy, $1.50 mn.

Separate abstracts were prepared on eleven sections of this report. A separate section (tabulated data) on the long-term toxic effects and skeletal dose at death of ^{226}Ra, ^{228}Ra, ^{90}Sr, ^{239}Pu, and ^{228}Th in dogs is included. (C.H.)

For abstracts of individual sections see: 45246, 45247, 45276–45282, 45354, and 45786.

45276 (COO-119-234, pp 70-84) TRANSLOCATION OF ^{239}Pu IN BEAGLE LIVERS. Taylor, G. N.; Jee, W. S. S.; Dockum, N. L.; Hromyk, E.; Brewster, L. (Utah Univ., Salt Lake City. Radiobiology Div.).

The initial liver deposition in the dog of tetravalent ^{239}Pu, given intravenously in a citrate buffer was principally in the hepatic cells. However, at approximately 200 to 300 days post-injection a transfer to the Kupffer cells began, and subsequently redistribution to the portal regions occurred. During this migration the plutonium was closely associated with iron staining pigment and the translocation appeared resultant to its attachment on this iron containing colloid. The principal plutonium induced lesions in the liver consisted of modified regenerative changes rather than an immediate primary effect at the initial deposition site and occurred after long latent periods. (auth)

45277 (COO-119-234, pp 85-93) THE ACUTE EFFECTS OF ^{226}Ra ON BLOOD CELLS OF CHINCHILLAS. Dougherty, Jean H. (Utah Univ., Salt Lake City. Radiobiology Div.).

Twenty chinchillas ranging in age from 104 days to about 5000 days were given single subcutaneous injections of ^{226}Ra. The five dose levels averaged 0.26, 77, 276, 832, and 2530 μCi/kg. The LD 50/30 for these chinchillas was about 800 μCi/kg. The blood cell changes, followed for six months after injection, consist of a depression in leukocytes and platelets in all except the lowest dose level. (auth)

45278 (COO–119-234, pp 94-119) A COMPARISON OF SERUM TRANSAMINASE LEVELS AND OTHER SERUM CONSTITUENTS IN DOGS BURDENED WITH ^{239}Pu, ^{228}Th, ^{228}Ra, AND ^{226}Ra. Stevens, Walter; Nabors, Charles J. Jr.; Berliner, David L. (Utah Univ., Salt Lake City. Radiobiology Div.).

Results are presented from a comparative study of the effects of ^{239}Pu, ^{228}Th, ^{228}Ra, and ^{226}Ra on certain blood values in adult beagle dogs. Th-228 and ^{228}Ra were chosen because they are daughter products of the parent nuclide ^{232}Th which is the principal nuclide found in Thorotrast; ^{239}Pu was selected because it is chemically similar to ^{228}Th and has a similar distribution pattern; ^{226}Ra was chosen because its distribution in the animal is identical to ^{228}Ra. The mode of decay and half lives for these nuclides are dissimilar and all of these nuclides produce a number of radioactive daughters with the exception of ^{239}Pu. Data are presented on the effects of these radionuclides on the serum glutamic-oxaloacetic (SGOT), serum glutamicpyruvic transaminase (SGPT), serum alkaline phosphatase, serum albumin and globulins, and albumin/globulin ratio. (C.H.)

45279 (COO–119-234, pp 180-90) EFFECT OF DAILY INJECTIONS OF ^{239}Pu ON RAT BONES. Dockum, N. L.; Jee, W. S. S. (Utah Univ., Salt Lake City. Radiobiology Div.).

Rats were administered 0.5 μCi of ^{239}Pu I.P. daily for 7, 6, 5, 4, and 3 days followed by from 1 to 5 days rest. Thymidine-^{3}H was administered I.P. to some of the groups one hour prior to sacrifice at 8 days. Another group received 7 I.P. injections of ^{239}Pu and after 58 additional days was administered ^{3}H-thymidine one hour prior to sacrifice. Control animals were given ^{3}H-thymidine at the same time, namely at 65 days. The parameters investigated included total osteoblasts per unit area, trabecular perimeter, osteoclasts, and osteoblasts per millimeter of trabecular bone surface. Following ^{239}Pu administration it was found that the mesenchymal cell population tended to favor the formation of osteoclasts rather than osteoblasts in both the short-term and long-term experimental animals when they were compared with the controls for the same time period. (auth)

45280 (COO–119-234, pp 191-210) QUANTITATIVE HISTOLOGICAL STUDY OF HUMAN LUMBAR VERTEBRAE. Bromley, R. G.; Dockum, N. L.; Arnold, J. S.; Jee, W. S. S. (Utah Univ., Salt Lake City. Radiobiology Div.).

A series of 92 undecalcified human lumbar vertebrae were thin-sectioned and quantitated by a method of point counting. The percent bone mineral in these sections decreased as a function of age with females decreasing more rapidly than males. Distinct differences were present in the lumbar vertebral body as compared to other trabecular and cortical bone indicating the need for separate standards. A value of 8.7 for percent bone was determined as indicative of osteoporosis as determined histologically. Osteoid seams were decreased in mid-adult life indicating decreased remodelling. The perimeter in cm/cm^2 of bone area for vertebrae was found to be higher than for cortical bone. The pathology of osteoporosis is discussed. (C.H.)

45281 (COO–119-234, pp 251-76) THE INCORPORATION OF VARIOUS METAL IONS INTO IN VIVO AND IN VITRO PRODUCED MELANIN. Bruenger, F. W.; Stover, J. B.; Taysum, D. H.; Atherton, D. R. (Utah Univ., Salt Lake City. Radiobiology Div.).

The interaction of in vivo produced melanin with various metal ions has been known for some time. Tracer quantities of alkaline earth metals were used to elucidate the nature of the binding between synthetic melanin and metal ions. Then the number of metals was expanded to members of several other groups of the periodic table. Binding affinities of these metal ions to synthetic melanin derived from L-DOPA were compared with the affinities for natural melanin derived from B-16 mouse melanoma. The elements were ranked according to their ability to combine with melanin. It was found that under physiological conditions the lowest level of incorporation was exhibited by the alkali metals, the highest by some transition elements such as iron and cobalt. Differences between the two melanins are discussed. (auth)

45282 (COO–119-234, pp 297-318) ^{137}Cs HALF-TIMES IN NORMAL, IN DYSTROPHIC, AND IN PREGNANT HUMANS. Lloyd, Ray D.; Zundel, Wayne S.; Mays, Charles W.; Wagner, William W.; Pendleton, Robert C.; Aamodt, Roger L. (Utah Univ., Salt Lake City. Radiobiology Div.).

The equivalent biological half-time, defined as 0.693 (observed body content/observed excretion rate), of environmental ^{137}Cs was evaluated in 89 individuals. The average half-times increased with age from about 20 days in 5 normal infants to about 100 days in 40 normal adults. Average half-times and standard deviations were 84 ± 28 days in 14 normal women, and 105 ± 25 days in 26 normal men. In 10 boys with Duchenne muscular dystrophy, the average half-time was only 14 days, or about $1/4$ of normal values established for the same ages in 7 healthy children. However, normal half-times were observed in 5 mothers of Duchenne boys (Duchenne dystrophy in female carriers is recessive). In 12 adults with various types of dystrophy, those with severe muscular disability (confined to wheelchairs) had abnormally shortened half-times. Progression of this disease appears to decrease the ability of the body to retain cesium atoms. In 7 pregnant women, the half-times averaged 46 days, or about $1/2$ that for the 14 non-pregnant women. The oral administration to 6 non-pregnant women of 1 mg ethinyl estradiol/day for times up to a month, concurrent with 2 g progesterone/day for the last 5 days caused little if any change in half-time. The mechanism by which pregnancy shortens the half-time of cesium is still uncertain. (auth)

45283 (COO–1184-4) THE METABOLISM OF NATURALLY OCCURRING ^{226}Ra BY SWINE. Final Report. Nelson, Neal S.; Rust, John H. (Chicago Univ., Ill. Dept. of Pharmacology). May 15, 1966. Contract AT(11-1)-1184. 177p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

Some aspects of the metabolic fate of naturally occurring radium-226 in swine were investigated. Samples of bone were obtained from ten leukemic and eight normal animals; samples of feed and water, tissues, and excretions were obtained from eight normal barrows and eight normal sows. In addition, eleven immature swine and eight neonatal swine were assayed. These samples were assayed for radium-226 content by the radon-222 emanation method. In fourteen skeletons assayed all bones had a gram-of-radium-226-per gram-of-ash-burden lying within about 20% of the mean burden for the entire skeleton. Of ten leukemic and twenty-four normal animals, the bone burden in the normal swine ranged from 4.10 ± 0.11 to 214.50 ± 5.65 fCi of radium-226 per gram ash, while burdens for the leukemic swine ranged from 7.90 ± 0.68 to 124.60 ± 2.23 fCi per gram of ash. There was no evidence of correlation between radium-226 burden and the incidence of leukemia in these animals. However, there was a correlation between geographical area of origin and radium-226 burden for these animals. Observed ratios, comparing pCi of radium-226 per gram of calcium in a product to the pCi of radium-226 per gram of calcium in the precursor of that product, suggested a selective preferential barrier for radium-226 at physiological boundaries. There was no discrimination observed at the placenta. Discrimination of the same order of magnitude as that reported for strontium-90 was observed for radium-226 between feces and diet and between plasma and diet. Discrimination 2- to 20-fold greater than that for strontium-90 was observed between urine and diet,

bone and diet, and milk and diet. If a unit barrier, consisting of all tissues which impede either entry into or exit from the blood vascular system, and association of radium with phosphorous rather than calcium during transport is assumed; then any differences in observed ratios can be explained on the basis of local influences on a basic mechanism. In this way, postulating a 6.5-fold hindrance to the passage of radium ions at each unit barrier, it is not necessary to describe specific or unique discrimination mechanisms for every tissue. (auth)

45284 (K-C-822) INHALATION CASES OF ENRICHED INSOLUBLE URANIUM OXIDES. Schultz, Neil B. (Oak Ridge Gaseous Diffusion Plant, Tenn.). Aug. 16, 1966. Contract W-7405-eng-26. 28p. (CONF-660920-1). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From 1st International Congress of the International Radiation Protection Assn., Rome, Italy.

The retention and excretion of uranium by about 80 employees routinely assigned to calcining and fluorinating uranium-bearing materials enriched in the ^{235}U isotope were closely followed for more than a year. In vivo measurements of body radioactivity were made by means of gamma spectrometry with two NaI scintillation detectors in an iron-room type, low background counter. Initial chest cavity burdens ranged from less than 0.006 μC to about 0.050 μC of enriched uranium, with only two cases having annual averages greater than 0.017 μC. The effective half-lives for chest cavity retention of the three employees who were temporarily removed from uranium processing areas ranged from about 120 to 250 days. Urine samples collected over 24 hours were analyzed for uranium mass, alpha activity, and ^{235}U enrichment. Average ratios of chest cavity burden to urine excretion rate increased from about 550 to 1100 between the initial and final determinations. Fecal excretion rates averaged 40% to 180% of the uranium urinary excretion rates. Material balance calculations showed agreement ranging from 50% to 75% between total urinary-fecal excretion and reduction in chest cavity burden as shown by in vivo measurements. Pulmonary function tests of the employees revealed normal respiratory performance. Medical data, including chest x rays, clinical urinalysis for albumin, and microscopic examination of urine for pathological cells and organisms, were normal in all cases. There was no evidence of personnel injury from these transient internal uranium depositions. (auth)

45285 (ORO-3461-8a) BIBLIOGRAPHY OF THE TOXICOLOGY OF NICKEL CARBONYL. Sunderman, F. William Jr. (Florida Univ., Gainesville. Dept. of Pathology). July 1, 1966. Contract AT(40-1)-3461. 6p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A list of 46 references to information on the toxicology of nickel carbonyl is given. (H.L.W.)

45286 (ORO-3461-8b) BIBLIOGRAPHY OF NICKEL CARCINOGENESIS. Sunderman, F. William Jr. (Florida Univ., Gainesville. Dept. of Pathology). July 1, 1966. Contract AT(40-1)-3461. 7p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Sixty-three references pertaining to the carcinogenic effects of nickel are presented. Papers on clinical and experimental studies are included, as well as those treating occupational parameters of respiratory tract carcinogenesis. (H.G.D.)

45287 (RCC-R-179) THE PULMONARY EXCRETION OF ^{14}C DIOXIDE FOLLOWING CONTAMINATION OF THE SKIN BY LABELLED CHLORELLA EXTRACT. Cook, D. A. (Radiochemical Centre, Amersham (England)). June 1966. 10p. Dep. BIS $0.50. HMSO 2s. 6d.

The specific activity of exhaled ^{14}C-labeled CO_2 was measured following accidental skin contamination by labeled Chlorella extract. Curves showing the variation of specific activity with time and the time integral of excretion are given. Results are compared with those obtained by urine sampling. (auth)

45288 (SAN-322-4) THE RELATION OF VIRUSES TO RADIATION AND RADIOACTIVE SUBSTANCES. Progress Report, October 1, 1965-September 30, 1966. Quilligan, J. J. Jr. (Loma Linda Univ., Los Angeles, Calif.). June 28, 1966. Contract AT(04-3)-322. 23p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Progress is reported on studies of methods for the detection of antigen-antibody reactions between viruses and their specific antisera. The influenza model was used to develop methodology that might be valuable with other viruses where techniques for identification are either more difficult or where no good method exists. The adsorption of ^{125}I-labeled viruses to glass was studied. Murine leukemia viruses were purified and labeled with ^{125}I and the adsorption of influenza and adenovirus to a commercially available silicon dioxide product, Cab-o-sil, was determined by either radioactivity or hemagglutination techniques. The optimum amounts of antigen, antibody, and adsorption surface for adsorption to silicone surfaces were determined for several members of the influenza group, with emphasis on murine leukemia viruses. An agent that causes myelogenous leukemia in CFW mice subjected to a fractionated dose 600R γ radiation was isolated from filtered cell-free extracts of spleen or lymph node. The characteristics of this agent and its relation to other murine leukemia viruses were studied. Amino acids-(^{14}C) were used to study the effects of influenza virus on cell growth of cultured L cells. The antiviral compound amantadine showed a consistent retarding effect on the growth of type A influenza virus and the incorporation on amino acids when tested in this system. (C.H.)

45289 (UCLA-12-595, pp 1-5) BIOCHEMISTRY. (California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology).

Progress is reported in studies on γ radiolysis of oleic acid and lipids from Wake Island Lagoon. High-resolution gas-liquid-chromatography, together with careful internal-standard quantitation of the results, has given new information permitting considerable refinement and correction of earlier impressions regarding the course and mechanism of oleic acid γ-radiolysis. A large mass of waxy material was found floating in Wake Island Lagoon. After chemical analysis it was decided that the material was lipid from the head or body of the sperm whale. (H.L.W.)

45290 (UCLA-12-595, pp 29-32) PHARMACOLOGY AND TOXICOLOGY. (California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology).

Progress is reported in studies on toxicity of potassium perrhenate in dogs and cats; phenacetin-induced nephritis; plasma minerals in normal and neutron-irradiated burros; and biological effects of Substance P. (H.L.W.)

45291 (UCLA-12-595, pp 67-71) BIOPHYSICS. (California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology).

Progress is reported in studies on biophysical instrumentation and biophysical hematology. A liquid curtain electrophoretic cell separator for separating viable cells is described. A high speed brain tumor section scanner has been developed. The use of technetium-99m in brain tumor cameras is described. Studies on radiation effects on lymphocytes are reported. Studies on blood cells of cancer patients are being made using electronic instruments. The behavior of red blood cells in fine capillary tubes and in suddenly applied electric fields is being studied. (H.L.W.)

45292 TRANSCUTANEOUS RESORPTION OF ^{137}Cs AFTER EXTERNAL CONTAMINATION OF RAT SKIN. Milosevic, Z.; Frankovic, S.; Draganovic, B. (Inst. for Application of Nuclear Energy in Agriculture, Veterinary Medicine, and Forestry, Belgrade). Acta Vet. (Belgrade), 15: 209-14(1965). (In Serbian).

It was established that resorption depends on the concentration and manner of contaminant application. The speed of transcutaneous resorption shows an increase up to sixty min following application, is maintained at approximately

the same level up to 120 min, and slowly decreases after two hrs. It is most intensive when ^{137}Cs is fixed by steaming and moistening the contaminated areas. Autohistoradiograms show that the activity is localized both in the cutis and subcutis. The law of resorption speed and concentration in the blood can be stated by biokinetic analysis of the results. (JPRS)

45293 EXCHANGE OF RADIOACTIVE MAGNESIUM IN THE TISSUES OF THE COW, CALF AND FETUS. Rogers, T. A. (Univ. of Hawaii, Honolulu); Simesen, M. G.; Lunaas, T.; Luick, J. R. Acta Ved. Scand., 5: 209-16 (1964).

A study was undertaken to compare the distribution of ^{28}Mg in calves and mature cows and to obtain some indication of the exchangeability of the maternal extracellular radioisotope with that of fetal tissues. Six normal calves were injected intravenously with different doses of ^{28}Mg and killed after 0.5, 1, 3, 6, 12, and 24 hr. Four gravid cows which were also injected with ^{28}Mg were killed at 0.5, 1.0, 3.0, and 6.25 hr after injection. The pattern of exchange of the isotope with intracellular magnesium in various tissues was generally similar to that reported for other species except that the equilibration rate was much slower than in the rat. An exception was that the testis ^{28}Mg in the 6-week-old calves exchanged more rapidly than in 150-g rats. The exchange of isotope from maternal plasma to fetal tissues was extremely slow. Even in the fetal liver and heart, the equilibration was less than 5% after 6 hr. The appearance of ^{28}Mg in the so-called slow fetal tissues and in the amniotic and allantoic fluids was insignificant in the 6.25-hr period studied. The fetal bones showed the highest gross radioactivity, but the sp act. was as low as in the muscle at 6.25 hr. The equilibration rates of the magnesium in various tissues are shown, and autoradiograms of tibia and femur are illustrated. (BBB)

45294 METABOLISM OF IODINE AND FUNCTIONAL STUDY OF THE THYROID. Daudin-Clavaud, P.; Swyngedauw, J. (Centre Oscar Lambret, Lille, France). Ann. Clin. Biol., 23: 701-49(1965). (In French).

Extensive physical, chemical, and clinical data are given in this review of the use of radioiodine to study thyroid physiology and pathology. The metabolism of radioiodine in other tissues is also dealt with. Use of ^{125}I, ^{131}I, and ^{132}I is discussed in terms of advantages and disadvantages of each, with data on doses used and measurement of incorporated radioiodine. Procedures for carrying out the various thyroid function tests with radioiodine are outlined, including indirect, in vitro tests which obviate exposure of a patient to radioiodine. Use of a neutron activation method to determine stable iodine (^{127}I) in blood and tissues is also explained. Methods for separating radioiodinated hormones, their precursors and metabolites are also described, as well as instrumentation for radioactivity measurements. Techniques which avoid or restrict the use of radioiodine in certain classes of patients, such as pregnant women and children, are also discussed. Clinical data illustrating the use and results obtained with these various procedures are given. (BBB)

45295 THE DIURNAL VARIATION OF PLASMA IRON TURNOVER AND ERYTHROPOIESIS IN HEALTHY SUBJECTS AND CANCER PATIENTS. Lockner, D. (Karolinska Institutet, Stockholm). Brit. J. Haematol., 12: 646-56(Sept, 1966).

The diurnal variation of plasma iron transport rate (PIT) was studied in patients with benign uterine cervical erosions (controls) and in 20 patients suffering from cancer of the uterine cervix. PIT showed considerable diurnal variations in control and cancer cases. Both the direction and intensity of variation differed from individual to individual. The mean values for PIT found in the morning did not differ significantly from those found in the evening both in control and cancer patients. Cancer patients had significantly higher PIT values as compared with controls in the evening as well as in the morning. The primary variant causing PIT variations was found to be the serum iron concentration. It was shown that plasma iron half time may have its own variations. The variation of erythropoiesis was studied measuring erythrocyte iron turnover in the morning and evening using for one study ^{59}Fe and for the other ^{55}Fe as a tracer. Six patients were studied using this technique; in four of them recirculation of radioiron was inhibited by injections of inactive iron. In most of these cases erythropoiesis was found not to vary substantially. (auth)

45296 COMPARATIVE METABOLISM OF RADIONUCLIDES IN MAMMALS. III. RETENTION OF ^{54}Mn IN THE MOUSE, RAT, MONKEY, AND DOG. Furchner, J. E.; Richmond, C. R.; Drake, G. A. (Los Alamos Scientific Lab., N. Mex.). Health Phys., 12: 1415-23(Oct. 1966).

Radiomanganese (^{54}Mn) was administered to mice and rats by the oral, intravenous and intraperitoneal routes and to dogs and monkeys by the oral and intravenous routes. Whole-body-counting techniques, utilizing 4π liquid scintillation counters, were used to determine whole-body-retention parameters. Retention functions consisting of the sum of three or four exponential expressions were adequate descriptions of retention until the body burden was less than 1 percent of the administered dose. The longest effective half-times after intravenous injections were 119, 146, 99 and 68 days for mice, rats, monkeys and dogs, respectively. Tissue distribution studies in rats showed that, for most tissues, concentration as a function of time roughly paralleled whole-body retention. Both bone and brain were found to have a slower rate of loss than other tissues. Using a parabolic relation between body weights and the integrals of the retention functions, it was estimated that 6×10^{-3} μC/ml was the maximum permissible concentration in water when the total body is the critical organ. This value is in good agreement with the current ICRP value of 8×10^{-3}. However, the value calculated for the lower large intestine (1×10^{-3} μC/ml) must remain the MPC_w for ^{54}Mn. (auth)

45297 DISTRIBUTION AND EXCRETION OF TECHNETIUM IN HUMANS. Beasley, T. M.; Palmer, H. E.; Nelp, W. B. (Battelle Memorial Inst., Pacific Northwest Lab., Richland, Wash.). Contract AT(45-1)-1830. Health Phys., 12: 1425-35(Oct, 1966).

Widespread use of ^{99m}Tc as a tracer in medicine and large scale separation of ^{99}Tc from fission product waste require that adequate knowledge of the metabolic properties of technetium be known so that realistic exposure limits can be imposed for the isotopes of interest. The present paper discusses a metabolic experiment using ^{95m}Tc (60 day $T_{\frac{1}{2}}$) and ^{96}Tc (4.3 day $T_{\frac{1}{2}}$) in which long-term excretion, retention and localization of these isotopes were measured using whole-body counting techniques. Following intravenous and oral administration both urinary and fecal excretion rates were measured and mathematical models were derived for technetium elimination. The latter should be helpful in estimating body burdens of the weak beta-emitting ^{99}Tc following inadvertent exposure. (auth)

45298 MICROSCOPIC AND AUTORADIOGRAPHIC STUDIES OF DISTRIBUTION OF URANIUM IN THE RAT KIDNEY. Jones, Edith Seymour (Oak Ridge National Lab., Tenn.). Health Phys., 12: 1437-51(Oct. 1966). (ORNL-P-1357).

The distribution of uranium in rat kidney has been studied by autoradiography and the data compared with that found by radiochemical analysis in order to obtain more information relating to the phenomenon of prolonged retention of uranium by kidneys of rats given an intravenous injection of a large mass of uranium. Dose levels of 10 μg U/kg, 100 μg U/kg and 1000 μg U/kg were used. These experiments indicate that retention is significantly higher at the two higher levels than at the lowest level. A concentration ratio, the ratio of the average concentration in the cortex to the average concentration in the entire kidney, was approximately 1.3. At early times post-injection the uranium tracks were observed mainly in proximal tubules, but an increasing proportion of total tracks was in distal tubules as post-injection time increased. Leaching and redistribution of uranium, in the processes of preparation,

appeared to be negligible. There were indications of a gradient in the cortex when aggregates were counted, but with aggregates excluded the concentrations were similar throughout the cortex. Proximal tubules of damaged kidneys did not show a change in diameter from those of normal kidneys, but glomeruli in injected rats tended to be smaller than in uninjected rats. Histopathological changes up to 28 days post-injection were striking at high dose levels. (auth)

45299 ^{90}Sr IN HUMAN HAIR AND BLOOD. Magno, P. J.; Baratta, E. J.; Leonard, I. E. (Public Health Service, Winchester, Mass.). Health Phys., 12: 1493-6(Oct. 1966).

This article presents results of a study of concentrations of ^{90}Sr and stable Sr in human hair and blood plasma. Hair was studied to determine if a constant relationship existed between ^{90}Sr in human hair and diet. Plasma was studied because it is the transport medium of ^{90}Sr in the body and therefore could provide information useful in the understanding of ^{90}Sr metabolism. This study was unable to establish that hair can be used as an indicator of dietary intake of ^{90}Sr. Data from five of the six children's institutions studied showed observed ratios in general agreement, but a discrepancy was noted in the samples from Albuquerque, N. Mex. Also the lack of correlation between ^{90}Sr in adult hair and plasma indicates that further study is required. (W.E.B.)

45300 THE FUNCTIONAL DEVELOPMENT OF THE RETICULO-ENDOTHELIAL SYSTEM. II. THE HISTOLOGY OF BLOOD CLEARANCE BY THE FIXED MACROPHAGES OF FETAL RATS. Reade, P. C.; Casley-Smith, J. R. (Univ. of Adelaide). Immunology, 9: 61-6(July 1965).

Results are reported from a histological study of the distribution of ThO_2 particles injected intravenously into fetal rats. (C.H.)

45301 EFFECT OF BERYLLIUM ON VARIOUS ENZYMES IN VITRO. Rothe, R.; Minden, H. (Deutsches Zentralinstitut fuer Arbeitsmedizin, Berlin). Int. Arch. Gewerbepathol. Gewerbehyg., 21: 161-6(Mar. 29, 1965). (In German).

Effects of different concentrations of Be^{++} solutions on various enzymes, including alkaline phosphatase, acid phosphatase, aldolase, phosphohexose isomerase, hexokinase, sorbitol dehydrogenase, lactate dehydrogenase, malate dehydrogenase, isocitrate dehydrogenase, succinate dehydrogenase, glutamate-oxalacetate dehydrogenase, glutamate-pyruvate transaminase, serum lipase, cholinesterase, and choline oxidase. The greatest inhibition of activity was observed with isocitrate dehydrogenase. Inhibition of phosphohexoisomerase and lactate dehydrogenase was very marked. Succinate dehydrogenase was only slightly inhibited, and no inhibition was noted for cholinesterase, lipase, choline oxidase, and acid phosphatase. The authors were unable to find a dependable method for ascertaining beforehand whether an enzyme would be affected by Be. Other metals, normally present in living organisms, may play significant roles and interact with Be. This metal could also be affected by a variety of processes in the living cell. (BBB)

45302 NEW RESULTS IN THE BIOLOGICAL WORK OF THE INSTITUTE OF STABLE ISOTOPES. Huebner, G. (Institut fuer Stabile Isotope, Leipzig. Deutschen Akademie der Wissenschaften, Berlin). Isotopenpraxis, 2: 116-19(Mar. 1966). (In German).

Results of recent works done in the Department of Physiology and Biochemistry of the Institute of Stable Isotopes, Leipzig, are summarized. The works include methodical progress in applying stable isotopes in biology, studies concerning protein and amino acid metabolism in plants, and studies of the effect of heavy water on physiological and biochemical reactions. (auth)

45303 CLEARANCE OF RADIOACTIVE ISOTOPES BY CIRCULATION IN THE DENTAL PULP. Meyer, Maurice W. (Univ. of Minnesota, Minneapolis). J. Dent. Res., 45: 407(Mar.-Apr. 1966).

Deep cavities (60 to 80 μ of dentin remaining) were prepared in teeth of dogs. Solutions of ^{24}Na (NaCl), ^{131}I ($NaIO_3$), or ^{42}K (KCl) containing 300 to 500 μC/ml were placed in the cavity and covered with mineral oil to minimize evaporation. A 6-mm scintillation probe equipped with a collimator was placed above the cavity and activity was continuously recorded. Changes in activity were observed during intact pulpal circulation, giving a type A curve and after circulation was stopped a type C curve. In some experiments, epinephrine or an equal volume of isotonic saline solution was infiltrated at the apex about 6 min after placement of the isotope (curve B). Type A and C clearance curves were obtained for periods of 1 to 1.4 hr. Removal of isotope from the cavity by the pulpal circulation was indicated by an increase in blood radioactivity, which tended to reach a plateau as the clearance rate diminished. When activity (cpm) curves were plotted semilogarithmically, type A curves could be approximated by a general two-component exponential equation ($CPM_{\text{at any time t}} = CPM_1e^{-k_1t} + CPM_2e^{-k_2t}$, where CPM_1 and CPM_2 are intercepts at the time of the initial count for two single exponentials with slopes k_1 and k_2 where the sum for all values of t reasonably reproduce the clearance curve). Type C curves approached a single exponential equation ($CPM = CPM_3e^{-k_3t}$). Apical infiltration of epinephrine altered the type A curve to type B, but comparable volumes of isotonic saline solution did not. There was an average delay of 2 min after epinephrine infiltration to appearance of an alteration. Duration to an epinephrine effect appeared to be dependent on the dose given. Approximation of the type A curve to a two-component exponential equation indicates that a min of two compartments is involved in this technic to observe radioactive clearance by the pulpal circulation. A qualitative relation between clearance and blood flow is evident. (BBB)

45304 INTESTINAL IRON ABSORPTION STUDIES USING ^{52}Fe AND ANGER POSITRON CAMERA. Fawwaz, R. A. (Univ. of California, Berkeley); Winchell, H. S.; Pollycove, M.; Sargent, T.; Anger, H.; Lawrence, J. H. J. Nucl. Med., 7: 569-74(Aug. 1966).

A technique is demonstrated whereby the rate of intestinal absorption of labeled substances is correlated with its distribution in the gastrointestinal tract. Its use in the study of iron absorption is discussed. The technique should be equally applicable to study of the intestinal site of absorption of virtually any appropriately labeled substance. The maximal rate of intestinal iron absorption occurs at the time iron is seen to be in the upper gastrointestinal tract. Iron retention in the proximal bowel occurs in man and may account for the slow phase of iron absorption. (auth)

45305 INCREASED ^{59}Fe ABSORPTION IN PATIENTS WITH HEPATIC CIRRHOSIS. Friedman, Ben I.; Schaefer, John W.; Schiff, Leon (Univ. of Cincinnati). J. Nucl. Med., 7: 594-602(Aug. 1966).

The effects of liver disease on iron absorption were studied in normal individuals and patients with hepatic cirrhosis or hepatitis. Absorption of ^{59}Fe-labeled ferrous citrate from the gastroenteric tract was determined in fecal excretions by a modification of Bonnet's method. The mean value of ^{59}Fe absorption in seven days was 50.4 ± 18.6 per cent in the controls and 74.0 ± 17.4 per cent in patients with hepatic disease. Neither the state of hepatic compensation nor the presence of a portasystemic shunt influenced the absorption of ^{59}Fe-labeled ferrous citrate. (H.G.D.)

45306 DEVICE FOR HOLDING RATS FOR THYROID UPTAKE DETERMINATIONS. Murdock, H. R. (Veterans Administration Hospital, Huntington, W. Va.); Blair, Bert. J. Nucl. Med., 7: 625-8(Aug. 1966).

An inexpensive apparatus is described for positioning rats and other small laboratory animals over a scintillation crystal for doing thyroid uptake studies. In vivo thyroid uptake determinations using the apparatus were com-

pared with in vitro determinations. Iodine-125 gave similar results by both methods, but ^{131}I gave higher results by the in vivo method. (H.G.D.)

45307 EFFECTS OF EXCESS DIETARY IODINE UPON RABBITS, HAMSTERS, RATS AND SWINE. Arrington, L. R.; Taylor, R. N. Jr.; Ammerman, C. B.; Shirley, R. L. (Univ. of Florida, Gainesville). J. Nutr., 87: 394-8(Dec. 1965).

Experiments were conducted with Dutch and New Zealand rabbits, Syrian hamsters, Long-Evans rats, and Hampshire-Duroc crossbred swine. The sexually mature females were bred to normal males of the breed or strain, and, at varying intervals of time after breeding, potassium or sodium iodide was added to the diet at the selected level. Observations were made for length of gestation, parturition time, lactation, and survival of young. From 250 to 1000 ppM iodine fed for 2 to 5 days caused increasing mortality of newborn rabbits. Hamsters were not affected by 2500 ppM iodine except for slightly reduced feed intake and decreased weaning weight of the young. Gestation time for rats and hamsters was not affected by iodine; however, prolonged parturition was observed in rats. Female rats and rabbits rebred after removal from dietary iodine produced and nursed litters normally. Swine were not affected by dietary levels of iodine which were toxic to rabbits and rats. With prolonged iodine feeding, certain abnormalities were observed. About 50% of the rats developed a peculiar type of hypersensitivity or tremors. This was characterized by temporary tremors which were usually induced by routine handling but which often occurred spontaneously. This was accompanied by a chronic turning of the head to one side in a manner similar to the wry neck condition normally attributed to an infection of the inner ear. Eye lesions developed in an equal proportion of the rats fed at high levels of iodine. The eyelids became swollen, some lacrimation occurred, and lids eventually closed. These results are of interest to radiobiologists in view of proposals of increased stable iodine intake as a prophylactic or therapeutic measure for accidental ingestion of radioiodine. (BBB)

45308 THROMBOHEMORRHAGIC LESIONS INDUCED BY COMBINED TREATMENT WITH RARE EARTH METALS AND EPINEPHRINE. Gabbiani, G.; Jacqmin, M. L.; Selye, H. (Univ., Montreal). J. Pharmacol. Exp. Therap., 152: 275-81(May 1966).

The thrombohemorrhagic activity of the rare earth metals, injected intravenously in the form of their trichlorides, was tested in rats at the following doses: scandium, terbium and ytterbium, 8 mg; yttrium, lanthanum, cerium, samarium, gadolinium, erbium and thulium, 10 mg; dysprosium and holmium, 12 mg; praseodymium, neodymium, europium and lutetium, 15 mg. These were the highest well-tolerated doses, as shown by preliminary toxicity tests. Epinephrine was given subcutaneously in two doses of 250 μg in 0.1 ml of water, the first dose 30 min before the rare earth metals and the second simultaneously. In the second experiment, the possible influence of several agents on the development of thrombohemorrhagic lesions was studied in rats that received intravenous doses of scandium chloride (the most active sensitizer). The first experiment indicated that intravenous administration of any one of the 16 rare earth metal trichlorides produces topical thrombohemorrhagic lesions at sites of epinephrine administration. Depending upon dosage and timing, it is possible to produce such lesions either at the epinephrine injection sites alone or in distant organs also, particularly in the kidney. The thrombohemorrhagic lesions produced by $ScCl_3$ plus epinephrine are regularly prevented by pretreatment with α adrenergic blocking agents, but not antihistaminics, antiserotonins, or anticoagulants. Apparently, after treatment with rare earth metals, the catecholamine can create local conditions which greatly favor topical thrombus formation even when the clotting of circulating blood is inhibited by an effective anticoagulant such as bishydroxycoumarin. (BBB)

45309 DETERMINATION OF COBALT, NICKEL, COPPER, AND ZINC IN RADIODERMATITIS. Sosnovskii, A. T.; Yagovdik, N. Z.; Orlova, Z. I. Mikroelem. Sel'sk. Khoz. Med., Ukr. Nauch.-Issled. Inst. Fiziol. Rast. Akad. Nauk Ukr. SSR, Mater. Vses. Soveshch., Kiev, 1962, 612-15(1963). (In Russian).

Cobalt, Ni, Cu, and Zn were detected colorimetrically in blood and skin of rabbits with experimental radiodermatitis and in clinical patients. In rabbits, Co, Cu, and Zn were increased both in blood and in damaged skin, while the values of Ni in all tissues and of the other elements in healthy skin remained normal. In the blood and damaged skin of patients, Co, Cu, and Ni concentrations were elevated. (H.G.D.)

45310 DIURNAL VARIATION IN ORGANISMIC RESPONSE TO VERY WEAK GAMMA RADIATION. Brown, Frank A.; Park, Young H.; Zeno, Joseph R. (Northwestern Univ., Evanston, Ill.). Nature, 211: 830-3(Aug. 20, 1966).

An experiment was made to determine whether small changes in level of radiation have any measurable effect on activity of an organism and whether the characteristic 24 hr pattern of metabolic variation is reflected in any comparable variation in responsiveness to a very weak radiation field. The hourly activity of 4 white mice was monitored quantitatively throughout a 3 month period under conditions of alternating periods of one and a half times and about eight times the level of the natural background radiation. To monitor the activity, rocking horizontal "racetrack" actographs were used. The mice were subjected to day–night changes in illumination and temperature. Cesium-137 was used as a source of radiation. Each of the 4 mice showed its own mean 24 hour pattern of activity for the 3 month period. All showed predominantly nocturnal activity. The results suggest that the increase or decrease of activity in response to the presence of the higher radiation field depends on the time of day. There appears to be a good correlation between the 24 hr variation in the consumption of oxygen and the response to weak γ radiation. The general similarity of the mean 24 hr oscillatory pattern, whether measured with actographs or respirometers, points to the existence of a widespread solar-day biological variation. (H.L.W.)

45311 A LIQUID SCINTILLATION METHOD FOR MEASURING ^{14}C UPTAKE IN PHOTOSYNTHESIS. Schindler, D. W. (North Dakota State Univ., Fargo). Nature, 211: 844-5(Aug. 20, 1966).

A liquid scintillation method for measuring ^{14}C uptake during photosynthesis is described and applications in the determination of ^{14}C uptake by algae are discussed. The method allows all photosynthesis determinations to be corrected individually for self-absorption and counting efficiency, it makes rapid and accurate counts possible, is adaptable to field use, and the activity of stock tracer solutions can be determined quickly and accurately. (C.H.)

45312 SODIUM ELIMINATION FROM BIOLOGICAL MATERIALS. Spronk, N. (Free Univ., Amsterdam). Nucl. Appl., 2: 259-63(June 1966).

Sodium can be removed from samples of biological materials by anion exchange. The operations are performed in one test tube which then also serves as the sample holder for subsequent gamma-ray analysis. In this system, ^{64}Cu was counted without detectable losses after reduction of the sodium quantities to $\leq 10^{-6}$ times the original amounts. Any remaining ^{24}Na activity in the gamma spectrum was subtracted electronically before counting. (auth)

45313 ^{90}Sr IN HUMAN BONES IN POLAND FROM 1962 THROUGH 1964. Liniecki, Julian; Karniewicz, Wieslawa (Inst. of Occupational Medicine, Lodz, Poland). Nukleonika, 11: 203-11(1966).

$^{90}Sr/Ca$ ratios in human bone (vertebrae) of all age groups in the years 1962, 1963 and 1964 in Poland are presented. The average values amount to 2.4, 5.5 and 5.3 pCi/gCa in 6–11 months old infants and 1.4, 1.6 and 2.5 pCi/gCa in adults, respectively. In older children and adolescents intermediate-levels were found. Time trends of ^{90}Sr in bones in different age groups from 1960 through 1964 are dis-

cussed. Yearly replacement-rate of calcium in cancellous bone (vertebrae) were calculated and most frequent values of the order of 6 to 10 per cent were obtained. (auth)

45314 ^{137}Cs BODY BURDENS IN ALASKAN ESKIMOS DURING THE SUMMER OF 1965. Hanson, Wayne C. (Battelle Memorial Inst., Richland, Wash.). Science, 153: 525-7(July 29, 1966).

Cesium-137 body burdens of Anaktuvuk Pass, Alaska, residents were about 30% less during the summer of 1965 than during 1964. Lower amounts of ^{137}Cs in the people reflected a similar decrease of this isotope in caribou flesh, which serves as the principal food of the natives. (auth)

45315 A STUDY ON THE DISTRIBUTION AND METABOLISM OF ^{32}P-LABELLED CYTOSTATIC SUBSTANCES, ENDOXAN AND TSPA, IN RATS. Voiculet, N. Stud. Cercet. Biochim., 8: 109-19(1965). (In Rumanian).

The kinetics of the blood and tissular distribution, as well as the clearance rate of labeled Endoxan and TSPA (thio-TEPA), two substances currently used in oncological therapy, have been investigated in Wistar rats. TSPA and Endoxan were intravenously injected in doses of 10 mg/kg and 50 mg/kg body weight, respectively. After the animals are sacrificed, samples of the blood, brain, liver, spleen, kidney, lung, striated muscle, urine, and the small intestine were collected at various time-intervals (30 m., 2, 4, 18, 24 hours, 3 and 6 days). Radioactivity was measured by means of an FH_{49} automatic device (Friescke & Hoepfner). Endoxan and TSPA displayed a different kinetic distribution. During the first 18 hours, a 64% clearance rate was recorded with TSPA and its metabolites and a 26% with Endoxan. The latter seemed to be wholly metabolized within 24 hrs. The biological half time of both substances varied relative to organs, showing a similar activity, however, only in muscles and the spleen which presumably were not involved in the metabolic process of these substances. (Rumanian Sci. Abstr.)

45316 RADIOPHOSPHORUS UPTAKE VARIATIONS IN WHITE RAT ORGANS AFTER EPIPHYSIOLYSIS AND PSEUDO-EPIPHYSIOLYSIS. Sahleanu, V. Stud. Cercet. Endocrinol., 16: 121-7(1965). (In Rumanian).

Radiophosphorus uptake variation in certain organs of white female rats (120-g body weight) was investigated after epiphysiolysis and pseudo-epiphysiolysis. A decrease of radiophosphorus uptake was found in the hypophysis, thyroid gland, thymus, kidney, and skeletal muscles, while an increase occurred in the uterus, adrenals, and liver. The data obtained in these experiments show that the pineal body is functionally correlated with the epithalamus. Within this body the presence of some partially antagonistic factors is suggested. (Romanian Sci. Abstr.)

45317 LOCATION OF RADIOACTIVE DEPOSITS IN GROWING FEATHERS OF PIGEONS AFTER INTRAMUSCULAR Na SULFATE (^{35}S) AND DL-CYSTEINE (^{35}S) INJECTIONS. Geierhaas, B. Heidelberg, Univ., 1965. 67p. $2.00 Gmelin, AED-Diss. 65-349.

Thesis

Deposition distributions of ^{35}S after injection of Na sulfate and DL cysteine were determined by autoradiographic methods. Results indicate the presence of inner and outer layers of the center layer emerging from the stratum cylindricum. (Gmelin Inst.)

45318 THE USE OF STABLE ISOTOPES AND ACTIVATION ANALYSIS FOR IN VIVO DIAGNOSTIC STUDIES. Wahl, Werner H.; Nass, Harold W.; Kramer, Henry H. (Union Carbide Corp., Tuxedo, N. Y.). 24p. (CONF-651111-7). ORAU. Gmelin, AED-CONF-65-323-10.

From Symposium in Medicine No. 9 Radioactive Pharmaceuticals, Oak Ridge, Tenn.

Stable isotopes that are detected by activation analysis procedures were used for human metabolic studies. The validity of this technique for the determination of iron plasma clearance and calcium metabolism is illustrated, and the use of stable tracers and activation analysis for radiosensitive subjects is discussed. Examples of current research using this technique to determine metabolic rates are given, and some comments are made concerning the potential of this broadly applicable technique. (auth)

Radiation Effects on Biochemicals

See also CHEMISTRY — Radiation Chemistry

45319 (AD-640261) DNA SYNTHESIS IN MIXED CULTURES OF DOG LEUCOCYTES: DIFFERENTIAL EFFECT OF X-RADIATION AND FREEZE-THAWING ON CELLULAR ISOANTIGENICITY. Main, R. K.; Cole, L. J.; Jones, M. J.; Haire, H. M. (Naval Radiological Defense Lab., San Francisco, Calif.). Aug. 30, 1966. 25p. (USNRDL-TR-1063). CFSTI $1.00 cy, $0.50 mn.

A marked induction of DNA synthesis occurred in 50-50 mixed cultures of peripheral blood leukocytes derived from sets of allogeneic (Beagle and mongrel) normal dog donors. DNA-synthetic activity at selected times was determined by liquid scintillation counting following pulse labeling of cell populations with ^{3}H-thymidine. In a typical experiment, DNA synthesis in mixed cultures attained a maximum value at the 6th day (61,000 CPM) followed by a steady decline thereafter (to 7,500 CPM by day 9), as contrasted with control values (65-86 CPM). In leukocyte cultures of cells isolated and mixed on the same day, considerable DNA labeling (1900-3000 CPM) occurred at time 0. These values declined, (600 CPM at 18 hours; 230 CPM at day 2), and then rose later (2400 CPM at day 4). Incubation of individual cell suspensions for 18 hours prior to mixing eliminated the elevated zero time label. X irradiation (2500 rads) of one (or the other) of the cell components of the mixture changed the reaction from a "two way" to a "one way" immunological reaction. When one (or the other) of a pair was frozen (-196°C) and thawed (37°C) three times and momentarily homogenized before mixing with intact allogeneic leukocytes, no induction of DNA synthesis occurred. These results suggest that leukocyte isoantigenic factors are not inactivated or destroyed by x irradiation and can induce DNA synthesis in allogeneic leukocytes; whereas, they are labile to freeze-thawing. The results are compatible with the known chemical and immunological properties of transplantation antigens. (auth)

45320 (LF-29) IMMUNE RESPONSE TO A SECONDARY STIMULUS WITH LEPTOSPIRA CANICOLA AND INFECTIOUS CANINE HEPATITIS IN BEAGLES EXPOSED TO ^{90}Sr. Clapper, W. E.; Sanchez, A.; Levy, J. (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. Dept. of Microbiology). June 1966. Contract AT(29-2)-1013. 15p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The secondary immune response to Leptospira canicola and Infectious Canine Hepatitis virus was depressed in Beagle dogs which had inhaled particles of ^{90}Sr 1-2 days and 7 days before the immune stimulus. The initial body burden was 31-46 microcuries per kilogram. The peak titre was reached for both antigens within eleven days in both control and exposed dogs. This amount of exposure did not accelerate the rate of decline of the antibodies, and the animals appeared to have recovered their ability to produce antibodies after five months. (auth)

45321 (SAN-632-1) ACTIVITIES OF NUCLEIC ACIDS AS A GENETIC PROBE. Progress Report. Spizizen, John (Scripps Clinic and Research Foundation, La Jolla, Calif. Dept. of Microbiology). June 8, 1966. Contract AT(04-3)-632. 19p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

X irradiation of DNA prepared from B. subtilis in dilute solution with 1000 R at a rate of 55 R per minute was found to decrease the transforming activity and the incorporation of DNA by recipient cells to a similar extent. The reduction in transformation and in incorporation was also similar at different times during the incubation period. The presence of irradiated DNA did not prevent the incorporation of control DNA when equal amounts of each were added at a total concentration of 1 μg/ml. Higher doses and higher dose rates were found to reduce the overall transforming

activity more than the incorporation of the DNA. When irradiated DNA was fractionated on methylated albumin-Kieselguhr (MAK), a higher percentage remained bound to the column at high salt concentration at neutral pH than in the case of control DNA. The fractions eluting at the usual position (0.5 to 0.6M NaCl) had reduced transforming activity compared to equal amounts of the corresponding control fractions. Some evidence was obtained for the degradation of donor DNA to acid-soluble and single-stranded material during the transformation of B. subtilis. No difference was detected between the fate of irradiated (1000 R, 55 R per minute) and control donor DNA once incorporated into recipient cells. (auth)

45322 (UCLA-12-595, pp 6-28) RADIOBIOLOGY. (California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology).

Progress is reported in studies on reactions of free hydroxyl radicals with thymine using the ESR spectrometer; reactions of hydrogen atoms with freeze-dried nucleic acids, nucleotides, nucleosides, purine and pyrimidine bases, base analogs, ribose and deoxyribose in the cavity of an ESR spectrometer; radiolysis of pyrimidines in aqueous solutions. Preliminary studies with uracil, cytosine, and 5-methyl cytosine suggest that the sensitivity of the chromophoric groups of the various compounds in the physiologically important pH region is strongly dependent on the pH and the substituents on the pyrimidine ring. γ radiation experiments with adenine demonstrate that this purine is destroyed to a much lesser extent than the pyrimidines when irradiated separately in aqueous solution. Progress is reported in studies on γ radiation of polynucleotides in aqueous solution; γ radiation of aqueous cytosine in the presence of chloride ions; early effects in vivo and in vitro of estrogenic substances on the avian liver; estrogen induced protein synthesis; assembly of ribosomes in the cytoplasm; isolation and characterization of cell organelles; control of protein synthesis; radiation effects on myelinization; regulation of malic enzyme level in the fowl liver by estrogens and androgens and its relation to other steroid-induced syntheses; effects of x radiation on the development of dehydrogenases in the neonatal rat brain; macronuclear DNA synthesis in Stentor; fluorescence polarization of mitochondrial reduced pyridine nucleotides during oxidative phosphorylation; radioiron assay of erythropoietin from cerebellar hemangioblastomas; age relationship of transplanted mouse liver cells in initiating hematopoietic recovery of lethally irradiated mice; effects of increased oxygen tension on the recovery of erythrocytosis following ionizing radiation; and chronic sodium chloride stress in irradiated rats. (H.L.W.)

45323 THE RADIOSENSITIVITY OF ESCHERICHIA COLI B CULTURES. V. THE TEMPERATURE-DEPENDENT BREAKDOWN OF DNA INDUCED BY X-RAYS. Hernadi, F.; Nagy, Zs.; Kovacs, P.; Valyi-Nagy, T. (Medical Univ., Debrecen). Acta Biol. Acad. Sci. Hung., 17: 233-7(1966).

The time and temperature dependent decrease in the DNA content of Escherichia coli B cells irradiated in vivo was examined by measuring the ^{32}P activities in the fractions obtained by the method of Schmidt-Thannhauser. The extent and rate of DNA breakdown was most significant in the samples incubated at 37°C. The DNA content of samples incubated at 21°C and 0°C also decreases depending on the x-ray dose received; this breakdown, however, was of a lesser extent and more protracted character. The increased ^{32}P activity in the acid-soluble fraction of the irradiated cultures confirms the fact of a DNA breakdown having taken place. (auth)

45324 NUCLEIC ACIDS IN THE BONE MARROW OF FOWL AFTER IRRADIATION WITH X RAYS. Mihailovic, M.; Rusov, C. (Inst. for Application of Nuclear Energy in Agriculture, Veterinary Medicine, and Forestry, Belgrade). Acta Vet. (Belgrade), 15: 241-7(1965). (In Serbian).

Pathomorphological and cytomorphological investigations of bone marrow and changes in the cell elements of the peripheral blood were carried out from 1 to 21 days following irradiation of White Rock breed cocks with doses of 400, 600, and 1200 R. The decreases and increases in RNA and DNA content are shown at different time intervals. (JPRS)

45325 ACTION SPECTRA FOR THE EFFECT GIVEN BY UV RADIATION ON THE DNA MOLECULE FROM PHAGE α IRRADIATED IN VITRO. Cremonese, Marta (Istituto Superiore di Sanita, Rome). Atti Accad. Naz. Lincei, Rend., Cl. Sci. Fis., Mat. Natur. (8), 40: 87-94(Jan. 1966). (In Italian).

Action spectra were obtained concerning the effect of ultraviolet radiation on the physico-chemical properties of the DNA of phage-α irradiated in vitro. Through the use of the analytical ultracentrifuge and of the spectrophotometer the following effects were studied: production of interruptions in the single polinucleotide strand; local denaturation; presence of a fraction of molecules resistent to denaturation, and increase in the bouyant density of irradiated DNA. All of the action spectra obtained showed a slight variation of the radiation efficiency in the range between 2600 and 2800 Å, and a well defined peak at $\lambda \simeq 2880$ Å. Threshold values for all of the examined effects are at 3000 Å. (auth)

45326 ACTION OF SMALL DOSES OF X-RAY RADIATION ON THE COAGULANT AND ANTICOAGULANT SYSTEMS OF THE BLOOD. Rzayev, M. F. (Azerbaydzhan Inst. of Experimental and Clinical Medicine, Academy of Medical Sciences, USSR). Azerbaidzh. Med. Zh., 43: No. 3, 15-18(Mar. 1966). (In Russian).

Rabbits were subjected to irradiation with x rays in the region of the ear at doses of 10 R every 3 days (total dose 60 R), irradiation with doses of 20 R every 5 days (total dose 60 R), and irradiation with two doses of 40 R at an interval of 7 days (total dose 80 R). A determination of the blood coagulation indices showed that the coagulating capacity of the blood was reduced, with the magnitude of the individual dose. While the time of coagulation was increased by 13, 39, and 99% on irradiation with doses of 10, 20, and 40 R, respectively, the corresponding increases in the fibrinolytic activity were 21, 70, and 66%, i.e., a dose of 40 R was less effective in increasing this activity than a dose of 20 R. The effect on blood coagulation of multiple irradiation was greater than that of irradiation one or two times at the same total dose, the action was cumulative to a certain extent. (CFSTI)

45327 EFFECT OF PRELIMINARY IRRADIATION WITH SHORT-WAVE ULTRAVIOLET ON THE LUMINESCENCE OF SOME BIOLOGICAL OBJECTS EXCITED BY LONG-WAVE ULTRAVIOLET. Gruzdev, A. D.; Tsellarius, Yu. G. (Inst. of Cytology and Genetics, Novosibirsk, USSR). Biofizika, 11: 181-3(Jan.-Feb. 1966). (In Russian).

Experiments carried out on human cartilage, bovine blood serum, tyrosine, phenylalanine, and the tripeptide, glycyl-glycyl-glycine indicated that preliminary irradiation of these substances and biological objects with short-wave uv increased the intensity of luminescence induced by irradiation with long-wave uv. The maximum luminescence involved was in the 480 to 520 mμ range. The relative increase in the intensity of induced luminescence, which may be ascribed to a photochemical process, decreased with the dose of radiation applied, i.e., saturation was reached. Study of a number of organic substances showed that many of them exhibited the effect in question in the crystalline state, but did not emit luminescence in the visible range in solutions either before or after irradiation with short-wave uv. Crystalline organic substances that showed considerable luminescence before irradiation with short-wave uv (e.g., salicylic, fluorescent dyestuffs, tryptophan) exhibited the opposite effect: the intensity of their luminescence on excitation with long-wave uv increased after preliminary irradiation with short-wave uv. This did not apply to tryptophan in solutions, which behave like the other amino acids studied. The luminescence of collagen prepared by dialysis of its solutions in a citrate buffer or in acetic acid was enhanced by preliminary irra-

diation with short-wave uv. Collagen films obtained by rapid drying of these solutions, which normally do not exhibit luminescence under the effect of long-wave uv, were activated by irradiation with short-wave uv. (auth)

45328 THE INFLUENCE OF GAMMA RADIATION ON THE BIOSYNTHESIS OF INDOLES AND GIBBERELLINS IN BARLEY: THE ACTION OF ZINC ON THE RESTITUTION OF GROWTH SUBSTANCE LEVEL IN IRRADIATED PLANTS. Kutacek, Milan (Inst. of Experimental Botany, Prague); Masev, Nikola; Oplistilova, Kveta; Bulgakov, Roman. Biol. Plant., Acad. Sci. Bohemoslov., 8: 152-63 (1966).

Growth retardation was studied in barley seeds exposed to γ rays to 5, 10, 20, 30, and 40 kR, stored for 14 days, and then germinated for 7 days. The effect of zinc (5×10^{-3}%) on growth, tryptophan content, indole auxin content, and gibberellin-like compound content was studied. (TSS)

45329 SHIFTS IN CONTENT OF GANGLIOSIDES IN THE BRAIN OF WHITE RATS IN CONNECTION WITH X-RAY IRRADIATION. Mkhitaryan, V. G.; Badalyan, G. E. (Erevan Medical Inst.). Biol. Zh. Arm., 19: No. 2, 54-9(Feb. 1966). (In Russian).

The amount of free gangliosides in the brain of white rats ranged within the limits of 1.17 to 1.51 and constituted on an average 1.26 ± 0.05 (expressed with respect to galactose in mg per g of dry tissue weight). The amount of fixed gangliosides was almost five times greater (an average 6.31 mg per g of dry protein weight). Within two days a single total x-ray treatment (800 R) caused a reduction in the amount of free gangliosides to 0.92 mg, 28.1% below the norm. Free ganglioside content continued to drop in succeeding days, reaching 0.81 mg on the 7th day (36.8% below the norm) and 0.77 mg on the 14th day (39.9% below the norm). The content of fixed gangliosides did not change. Chronic x-ray treatment (30 R per day for 30 days) reduced free gangliosides by 26.6%. (JPRS)

45330 MOLECULAR BASIS FOR RADIATION EFFECTS ON CELLS. Hutchinson, Franklin (Yale Univ., New Haven). Contract AT(30-1)-2653. Cancer Res., 26: 2045-52(Sept. 1966). (TID-23208).

Reasons are pointed out for the generally accepted conclusion that radiation inactivation of cells happens as the result of only a few events, or even a single event, at the molecular level. Nine reasons are then given for thinking that DNA is the radiosensitive target. From the known mechanisms of radiation damage to DNA, the inactivation of single-stranded and double-stranded viruses can be at least partly understood. A simple hypothesis is that ionizing radiation acts by either breaking the DNA molecule physically in two, thus interfering with its continuity, or by destroying bases on both complementary strands. If these ideas are applied to the radiation inactivation of bacterial or mammalian cells, it is difficult to see why they are so radioresistant, even making allowance for the operation of repair systems. (auth)

45331 CYTOTOXIC AND RADIOMIMETIC ACTIVITY OF IRRADIATED CULTURE MEDIUM ON HUMAN LEUKOCYTES. Kesavan, P. C.; Swaminathan, M. S. (Indian Agricultural Research Inst., New Delhi). Curr. Sci. (India), 35: 403-4(Aug. 20, 1966).

Human leukocytes were cultured in media exposed to various doses of ^{60}Co γ rays. The most readily apparent effects observed in the cultures were: considerable inhibition of mitosis, pyknosis, chromosome fragmentation and polyploidy, and micronuclei formation at telophase. Refrigeration of the irradiated media prior to its use did not diminish cytotoxic properties. (H.G.D.)

45332 DIGESTION FUNCTIONS OF INTESTINAL EPITHELIUM IN THE CASE OF GRAVE RADIATION INJURIES. Ugolev, A. M.; Iezuitova, N. N.; Nadirova, T. Ya.; Timofeeva, N. M. (Pavlov Inst. of Physiology, Academy of Sciences, USSR). Dokl. Akad. Nauk SSSR, 166: 472-5 (Jan. 11, 1966). (In Russian).

The enzymatic activity of the intestinal surface, of homogenates of intestinal tissue, and of intestinal contents of female white rats that had been x-irradiated to 1150 R was determined. In the controls the invertase activity of the surface preparations was about two-thirds of that of the homogenates, and that of the intestinal contents was about 15% of that of the intact intestine. Four hrs after the irradiation the surface activity had decreased somewhat because of the desquamation of the epithelium, and the activity of the contents had increased although the homogenate activity did not change significantly. Between 24 and 48 hr the intact intestine and the homogenate activity decreased sharply, and at 72 hr such activity was essentially zero. The peptidase activity in the controls was about the same for homogenate and surface preparations. After the irradiation, the activity decrease in the intestinal section was especially sharp between 24 and 72 hr, but the homogenate activity was still rather high at 72 hr. The amylase activity of the contents increased greatly 24 hr after the irradiation and was still quite high at 72 hr. (TTT)

45333 EFFECT OF γ IRRADIATION ON THE EXCHANGE OF RAPIDLY LABELED RNA IN HeLa CELLS. Kalendo, G. S.; Kuzin, A. M. (Inst. of Biological Physics, Academy of Sciences, USSR). Dokl. Akad. Nauk SSSR, 167: 678-80(Mar. 21, 1966). (In Russian).

Experiments with actinomycin D confirmed the existence of two rapidly labeling RNA fractions, one of which has a lifetime of 10 min and is more sensitive to actinomycin. It is shown that during γ irradiation of cells the content of the fraction stable to actinomycin D undergoes regular (2 hr period) changes. It was concluded that the periodicity of the RNA metabolic processes in the irradiated cells is related to the RNA fractions that function in the nuclei. (R.V.J.)

45334 EFFECTS OF X-IRRADIATION ON ANTIBODY FORMATION TO OVINE LUTEINIZING HORMONE (NIH-LH) IN RATS. Wakabayashi, Katsumi; Tamaoki, Bun-ichi (National Inst. of Radiological Sciences, Chiba, Japan). Endocrinology, 79: 643-6(Sept. 1966).

Active immunization of male rats with luteinizing hormone (NIH-LH-S7) caused marked atrophy of the testes, prostate, and seminal vesicles, hypertrophy of the anterior pituitary and the adrenal glands, and an increase of LH and protein synthesis in the anterior pituitary gland. A total of 1500 R of x-irradiation, divided into 6 equal doses and given before each inoculation of the antigen, effectively prevented all the above changes, except adrenal hypertrophy, which were caused by LH immunization. The effects of x-irradiation seemed to stem largely from its inhibitory action on antibody formation. The results suggest that antibody formation is primarily responsible for the biological consequences of active LH immunization. (auth)

45335 BIOCHEMICAL DEFINITION OF YELLOW-VIRESCENT AND LIGHT-GREEN SUPPRESSOR MUTATIONS IN BARLEY. Jain, M. L. (Univ. of Minnesota, St. Paul). Genetics, 54: 813-18(Sept. 1966).

Chlorophyll content, free amino acids, and soluble leaf proteins were studied in barley seedlings of wild type, an x-ray-induced yellow-virescent mutant, and an x-ray-induced light-green suppressor revertant. It is suggested that the mutation has affected the amino acid utilization in the synthesis of a protein. (auth)

45336 PRELIMINARY OBSERVATIONS ON SOME ASPECTS OF ABIOGENESIS OF AMINO ACIDS: EFFECT OF ULTRAVIOLET IRRADIATION ON AQUEOUS SOLUTIONS OF HEXAMETHYLENE TETRAMINE. Perti, O. N. (MNR Engineering Coll., Allahabad, India); Rastogi, R. C. Indian J. Biochem., 3: 131-2(June 1966).

The effect of ultraviolet radiations on aqueous solutions of hexamethylene tetramine in the presence and absence of some organic and inorganic catalysts was studied. In the absence of catalysts, irradiation for about 10 hr results in the formation of alanine only, whereas in the presence of certain catalysts two or more amino acids, viz., alanine, glycine, aspartic acid, and amino-n-butyric acid are formed, depending upon the duration of irradiation period

(6 to 50 hr) and the catalyst employed. Irradiating for 18 to 20 hr of a solution of hexamethylene tetramine through which carbon dioxide is passed, results in the formation of glycine alone, whereas in the presence of benzophenone in the reaction mixture, glycine, alanine, and amino-n-butyric acid are formed after 6 to 7 hr of irradiation. Prolonged irradiation results in the destruction of the amino acids formed. (auth)

45337 SOME ASPECTS OF THE INACTIVATION OF PROTEINS BY RADIATION. **Dose, Klaus (Max-Planck-Institut fuer Biophysik, Frankfurt am Main). J. Ark. Med. Soc., 62: 96-9(Aug. 1965).**

Experiments on the effect of uv irradiation (90% at 253 mμ) on amino acids and proteins are reported. The relation between the radiation dose and the reductive splitting of the disulfide bond was studied. The quantum efficiency of the reaction was not greatly influenced by oxygen. A postirradiation decrease was seen in lysozyme activity which was closely correlated to the rupture of its four disulfides. If one of the three disulfide links in insulin is reduced by thioglycolic acid, total inactivation occurs. A similar process occurs with uv irradiation with a dose less than 30 mole quanta per mole. Studies were also done to compare the photochemistry of disulfide-containing proteins with that of proteins which contain practically no disulfide links, such as lactic acid dehydrogenase (LDH) and alcohol dehydrogenase (ADH). The quantum efficiency to produce uv inactivation of each was found to be about 10^{-3}, ten times higher than was found for the disulfide containing proteins, lysozyme or insulin. The general response of LDH and ADH was similar to those proteins which contained disulfide links and in the disulfide-free proteins the tertiary structure was rigorously changed with uv irradiation. It is concluded that uv-induced inactivation of all proteins depends largely on changes in their secondary and tertiary structures. Besides the rupture of disulfide bonds there are pronounced changes in hydrogen bonds and hydrophobic interaction responsible for these effects. Changes in the primary structure of protein seem less important in radiation inactivation effects. (TSS)

45338 INFLUENCE OF IONIZING RADIATION ON FUNGAL CELLS AND THEIR PECTOLYTIC ENZYMES. **Vas, Karoly. Kertesz. Szolesz. Foiskola Kozlemeny, 28: 305-13(1964). (In Hungarian).**

The effects of x radiation (1.2×10^6 rads) on mycelia of Aspergillus foetidus and A. niger were studied. The fungal cells were observed to lose their reproductive power, but the activity of their pectolytic enzymes was not affected. The permeability of cytoplasmic membrane for amino acids was increased if wet mycelium was irradiated; dry mycelium was not affected. Pectolytic fractions were prepared and irradiated with a resulting activity loss. (TSS)

45339 AUTOLYTIC DECOMPOSITION OF PROTEINS IN RAT LIVER MITOCHONDRIA OF ANIMALS WITH RADIATION INJURY. **Lomsadze, B. A.; Grigoryan, G. L. (Lomonosov State Univ., Moscow). Nauch. Dokl. Vyssh. Shkoly, Biol. Nauk, No. 4, 97-8(1965). (In Russian).**

Male rats were x-irradiated once with 600 and 800 R, at 238 R/min. The rate of autolytic decomposition was detected in liver mitochondria by the increase of free amino acid N. Irradiation produced increased autolysis. Apparently, the autolytic process first occurred in all subcellular particles containing proteolytic enzymes and later included whole cells and organs of the irradiated animals. (H.G.D.)

45340 DISC ELECTROPHORESIS OF IRRADIATED TRYPSIN. **Ghiron, Camillo A.; Ghiron, Arlene F.; Spikes, John D. (Univ. of Utah, Salt Lake City). Photochem. Photobiol., 5: 201-5(Feb. 1966). (COO-875-39).**

Trypsin exposed to various types of radiation under different conditions shows a variable degree of inactivation, depending on the substrate used for enzyme assay. These results have been interpreted by postulating the presence of three classes of molecules (active, damaged, and inactive) after treatment. The active class of molecules is defined as the fraction of trypsin molecules remaining active as measured by the hemoglobin assay, while the inactive class represents those inactive in the casein assay. The damaged class consists of trypsin molecules which are active as measured by the casein assay but inactive as measured by the hemoglobin assay. To investigate this phenomenon, trypsin inactivated by uv, γ, and visible radiation, in the presence of sensitizing dyes, and autolysis, was examined by disc electrophoresis. Untreated twice-crystallized salt-free trypsin separated into four bands which moved toward the cathode; the main band, which had the greatest mobility, contained all of the detectable tryptic activity. The next most mobile band was assumed to be a chymotrypsin contaminant. The other two bands are of unknown nature. A progressive loss of all the bands was observed when the enzyme was inactivated by procedures which produce a damaged class of trypsin molecules, i.e., flavin-sensitized photooxidation, autolysis, and treatment with uv and γ radiation. No loss of the main band was observed during photoinactivation with methylene blue and eosin Y as sensitizers. In this latter case, it is postulated that the trypsin inactivation products must be of such a nature that the net charge and conformation of the protein is not greatly changed, thus permitting all of the protein to remain in the same band during electrophoresis. (BBB)

45341 THYMINELESS DEATH AND ITS RELATION TO UV SENSITIVITY IN ESCHERICHIA COLI. **Cummings, Donald J.; Taylor, Austin L. (Univ. of Colorado, Denver). Proc. Nat. Acad. Sci. U. S., 56: 171-6(July 1966).**

Thymineless death in various strains of E. coli was examined and compared with sensitivity to uv irradiation and to mitomycin (MC) treatment. It was found that E. coli B, a strain ultrasensitive to uv and MC, displayed a new and unexpected sensitivity to thymine deprivation. Instead of the usual delayed response to thymine starvation, death commenced immediately and at an exponential rate about twice that ultimately obtained in B/r. On the other hand, thymineless death in uv- and MC-ultrasensitive strains of E. coli K12 proceeded with the usual lag of about 50 min before the onset of cell death. From these results it was concluded that a single defect in DNA repair cannot satisfactorily account for both ultrasensitivity to thymineless death and ultrasensitivity to either uv or MC. (auth)

45342 THEORY OF THE KINETICS OF ENZYME INACTIVATION IN SOLUTION BY IONIZING RADIATION. [PART] I. **Arley, Niels (Norsk Hydro's Inst. for Cancer Research, Oslo. Univ. of Copenhagen). Radiat. Res., 29: 1-17(Sept. 1966).**

Previous treatments of the kinetics of enzyme inactivation in dilute aqueous solution by ionizing radiation are extended in this paper. For the case that the enzyme is predominantly inactivated by one of the radiation products formed in the water by the irradiation, the kinetic equations are solved exactly in the general case of arbitrary values of the rate constants without using the simplifying assumptions made in the previous treatments. The case of two or more radiation products, and their recombination products such as H_2O_2, contributing to the inactivation of the enzyme will be treated in a following paper. The formula for the dose-inactivation curves is worked out and a check obtained of the simplifying assumptions previously made, which are shown not to be valid. A recipe is worked out in all details for obtaining the numerical values of all five rate constants, by fitting the model to experimental data. A later paper will apply this theory to experimental data. Finally, the possible application of the model for the elucidation of the respective role of scavenging and masking effect in the basic mechanisms underlying chemical protection and sensitizations discussed. (G.O.Y.)

45343 ON THE ACTIVITY OF DNA EXTRACTED FROM NORMAL AND IRRADIATED TISSUES ON LIVER CATALASE. **Furnica, Maria. Stud. Cercet. Biochim., 8: 43-8(1965). (In Rumanian).**

Qualitative changes induced by irradiation on the DNA are reported. The influence of either normal or irradiated DNA on liver catalase activity has been tested both in nor-

mal and irradiated Wistar rats sacrificed 3 days after a 1000 R x-ray exposure. DNA extraction was achieved by the modified Zamenhof-Griboff-Marullo method. The activity of catalase in normal rat liver was manometrically measured, either in the presence or absence of the DNA derived as previously reported or of commercial DNA added. A 35% increase in the catalase activity was recorded with native DNA extracted from normal liver whereas the DNA obtained from irradiated liver rose this activity with 92%. The urea denaturated preparation reduced the activity of catalase with 20%; a commercial DNA did not influence this activity. The activity of native DNA was due presumably to the presence of nondenaturated macromolecules. (Romanian Sci. Abstr.)

45344 THE INFLUENCE OF IONIZING RADIATIONS ON THE ADRENAL CORTEX AS ESTIMATED BY THE DETERMINATIONS OF THE BLOOD POTASSIUM CONTENT IN RABBITS. Petrescu, D. Stud. Cercet. Fiziol., 10: 89-95(1965). (In Rumanian).

Both whole-body irradiation in single doses of 800 R and recurrent intramuscular administration of serum derived from either normal or irradiated rabbits as well as the intravenous injection of a killed bacterial suspension (Proteus X_{19}^{9}) usually induces an increase in serum potassium concentration in rabbits. This increase is more obvious after irradiation and administration of either bacteria or normal serum than after the injection of irradiated rabbit serum. By assuming that the increase in blood potassium concentration indicates a certain degree of adrenal cortex deficiency, it follows that the serum of irradiated rabbits contains some factors that act upon the adrenal cortex function, hindering the inhibitory activity of direct irradiation or homologous normal serum and bacterial antigen administrations. (Rumanian Sci. Abstr.)

45345 CHROMATOGRAPHIC-COLUMN FRACTIONATION OF TISSULAR RNA BY UV RADIATION. Portocala, R. Stud. Cercet. Inframicrobiol., 16: 11-17(1965). (In Rumanian).

The intensity of the hypochrome induced by x rays in the RNA extracted from normal mouse brain varied with the time of exposure. Irradiated RNA was analyzed by means of column chromatography. Methylated albumin and DEAE-cellulose were used as adsorbant substances. The results suggest that the secondary structure of the irradiated RNA underwent modifications. It is likely that the hypochrome effect and the changes in the secondary structure of irradiated RNA might be due to some dimers of uracil similar to those of thymine reported for DNA. (Rumanian Sci. Abstr.)

45346 INACTIVATION OF SIMIAN VIRUS 40 INFECTIVITY AND ANTIGEN-INDUCING CAPACITY BY ULTRAVIOLET LIGHT. Carp, R. I.; Gilden, R. V. (Wistar Inst. of Anatomy and Biology, Philadelphia). Virology, 27: 639-41(Dec. 1965).

The effect of uv irradiation on the ability of simian virus 40 (SV40) to produce nonvirion specific antigen, SV40-induced complement-fixing antigen (ICFA), was studied. It was found that the ability of a virus pool to induce SV40 ICFA decreases with the time of exposure to uv. The rate of inactivation followed first-order kinetics through the uv doses studied. Virus infectivity was also inactivated by uv following first-order kinetics for the first 3 to 4 min but at a faster rate than the inactivation of ICFA-producing capacity. Multiplicity reactivation was not a factor in the results obtained in the SV40 ICFA determinations. The uv-inactivation rates of infectivity and ICFA production obtained in the dark paralleled the rates obtained in white light. The fact that the ability of SV40 to induce antigen production was reduced by exposure of the virus to uv indicates that SV40 ICFA is coded for by the genome of the incoming virus and implies that at least part of the genome persists in some way in the transformed cells, since these cells contain SV40 ICFA without any evidence of infectious virus. (BBB)

45347 STABILITY OF B-VITAMINS IN GULF OYSTERS PRESERVED BY GAMMA RADIATION. Liuzzo, Joseph A.; Barone, William B.; Novak, Arthur F. (Louisiana State Univ., Baton Rouge). 8p. (CONF-660428-2). ORAU. Gmelin, AED-CONF-66-075-3.

From Federation of American Societies for Experimental Biology, 50th Meeting, Atlantic City.

The effects of ^{60}Co gamma radiation on B vitamins were studied in oysters given 0.2 or 0.6 Mrads. To account for seasonal variations in vitamin concentrations, assays were determined for two groups of oysters procured several months apart. The vitamins assayed were thiamine, riboflavin, niacin, pantothenic acid, biotin, pyridoxine, folic acid, and vitamin B-12. Results show that radiopasteurization of oysters at the 0.2 Mrad dose did not seriously affect vitamin content. Losses of B vitamins are not considered extensive except for thiamine and pyridoxine. (H.G.D.)

Radiation Effects on Tissues

Refer also to abstract 45254.

45348 (AD-637782) EVIDENCE FOR PLURIPOTENTIALITY OF MARROW STEM CELLS: MODIFICATION OF TISSUE DISTRIBUTION OF IN VIVO ^{125}I-UdR LABELED TRANSPLANTED MARROW. Bryant, B. J.; Cole, L. J. (Naval Radiological Defense Lab., San Francisco, Calif.). June 9, 1966. 28p. (USNRDL-TR-1028). CFSTI $2.00 cy, $0.50 mn.

Mice were exposed to a lethal dose of x rays (900 rad) and transfused with 5×10^6 syngeneic bone marrow cells. Subgroups of these mice were either made polycythemic, anemic, or served as controls. Regenerative activity in the hemopoietic and lymphopoietic tissues was assessed by flash-labeling with ^{125}I-iododeoxyuridine. The evidence based on the incorporation of ^{125}I-labeled iododeoxyuridine into DNA, organ weights, histological and ^{3}H-thymidine radioautographic data suggests that stem cells in the bone marrow of adult mice may contain both hemopoietic and lympho-/plasmacytopoietic potentialities. The methodology and some possible objections to the interpretation of the data are discussed, and future work is indicated. (auth)

45349 (AD-639299) THE SEQUESTRATION OF ERYTHROCYTES IN IRRADIATED DOGS. Harbert, J. C.; Page, N. P. (Naval Radiological Defense Lab., San Francisco, Calif.). July 29, 1966. 22p. (USNRDL-TR-1051). CFSTI $1.00 cy, $0.50 mn.

Fifteen dogs received 200 R of x ray exposure. Twenty-four hours following irradiation they were injected with both free ^{55}Fe and ^{59}Fe-labeled red cells which had been heat damaged. ^{55}Fe measurements indicated a significantly decreased plasma clearance and red cell incorporation of iron indicating decreased erythropoiesis as a result of x ray exposure. Sequestration of heat damaged red cells by the RES was decreased in the irradiated dogs compared to non-irradiated controls. The explanation given is that at relatively low exposures to irradiation, endogenous cellular debris imposes a blockade of the RES so that only small amounts of injected particles produce a noticeable delay in clearance. No difference in plasma iron turnover could be detected between irradiated and control dogs. It is suggested that iron turnover is an unreliable measure of erythropoiesis. (auth)

45350 (AD-640158) X-IRRADIATION OF DEFINED AREAS OF THE HEADS OF WEANLING RATS: EFFECT ON BODY GROWTH AND INCISOR DEVELOPMENT. Wachtel, L. W.; Cole, L. J.; Bailey, J. S. (Naval Radiological Defense Lab., San Francisco, Calif.). Aug. 26, 1966. 21p. (USNRDL-TR-1061). CFSTI $1.00 cy, $0.50 mn.

Weanling rats whose bodies were lead-shielded, were x irradiated to defined areas of the head. Body growth, incisor tooth development, and histopathology of the tongue and glossopharyngeal area (throat) were studied for a period of 7 weeks following irradiation. An x-ray dose of 2000 rads to the head and throat caused injury to the tongue and palate that resulted in a reduction in food intake and a

marked loss in weight of the exposed rats. The more extensive the head area irradiated the higher the mortality, attaining 100 per cent deaths at 9 to 10 days when the entire head was irradiated. Irradiation of the throat only with 2000 rads elicited 50 per cent deaths. There was a persistent reduction in the growth rate of the survivors compared to that of non-irradiated controls. These effects were not seen if the base of the tongue only was irradiated. The maxillary incisors, which received 120 rads through the lead shielding, after 5 to 7 weeks were either lost or grew abnormally in all throat-irradiated rats. The same dose of x radiation to the incisors of rats in which the base of the tongue only was irradiated, had no deleterious effect on their development. The possibility of a relationship between metabolic disturbances caused by throat irradiation, and growth of the incisors receiving low doses of x radiation, is postulated and discussed. (auth)

45351 (BNL–10534) LYSOSOME ACTIVITY IN RADIATION INDUCED INTESTINAL INJURY. McFadyen, D. M.; Baker, D. G. (Brookhaven National Lab., Upton, N. Y.). [1966]. Contract AT(30-2)-Gen-16. 25p. (CONF-660917–2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Gastrointestinal Radiation Injury Symposium, Richland, Washington.

Acid hydrolases in the subcellular fractions were studied in three anatomical regions of the small intestine. These consisted of the first 20%, the next 40% and the last 40%. Mucosa weight loss following 800 rads whole-body x irradiation was used as an index of injury. β-glucuronidase and acid phosphatase activities increased on day 2, reached a maximum by day 3 and returned to normal by day 4. Protein concentrations decreased by day 3. A segmental variation was observed for the intestine with the largest enzymatic activity present in the upper segments. The relationship between acid hydrolases and intestinal injury and recovery are discussed. (auth)

45352 (CEA-R-2978) DONNEES HISTOLOGIQUES SUR LE PORC (SUS SCROFA), UTILISABLES EN RADIOBIOLOGIE. I. HISTOLOGIE NORMALE DE CERTAINS APPAREILS. II. ETUDE DES LESIONS CONSECUTIVES A UNE IRRADIATION GAMMA TOTALE. (Histological Data Concerning the Pig (Sus Scrofa) for Use in Radiobiology. I. Normal Histology of Certain Systems. II. Injuries Caused by Total Gamma Irradiation). Guenet, Jean-Louis; Vaiman, Marcel; Nizza, Pierre (Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires). June 1966. 84p. Dep. mn.

It has come to be recognized recently that the anatomical and physiological characteristics of the domestic pig are such that it is a very suitable laboratory animal for radiobiological studies. Research on the histology of pigs of different species is described with a view to compiling a record which might be of help to future workers in this field. The second part of the work deals with anatomical and histological injuries caused by total exposure to gamma radiation from cobalt-60 at doses of 285 R. (H.L.W.)

45353 (CEA-R–2984) RADIOSENSIBILITE DES CHLORELLES AUX ELECTRONS ACCELERES DE MOYENNE ENERGIE. (Radiosensitivity of Chlorella after Medium Energy Accelerated Electron Irradiation). Roux, Jean-Claude (Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires). June 1966. 72p. Dep. mn.

Thesis. Submitted to Univ., Grenoble, France.

Survival curves were constructed for Chlorella pyrenoidosa exposed to 0.65 and 1 Mev electron beams. Multiplication capacity was determined for cells on porous membranes, and dose was calculated by Fricke dosimetry. Anoxia was shown to be more effective in survival than dose fractionation. RBE of 0.65 and 1 Mev electrons was less than that of 180 kev x rays. (H.G.D.)

45354 (COO–119-234, pp 227-50) THE LONG-TERM EFFECTS OF A SINGLE DOSED EXTERNAL X IRRADIATION TO THE JAWS OF RABBITS. Bartley, M. H.; Dedekind, K. L.; Jee, W. S. S. (Utah Univ., Salt Lake City. Radiobiology Div.).

A 250-kvp x ray machine was used to deliver doses of 1500, 2000, and 4800 R to the left jaws and cheek teeth of weanling rabbits. A control group of rabbits was allowed to age along with the treated groups. Four jaw tumors of the osteogenic sarcoma, sclerosing type were induced in the 1500 and 2000 R treated animals. None were encountered in the 4800 R treated group in which marked destructive lesions predominated. The other responses to irradiation were divided into three grades according to their severity. (auth)

45355 (COO–1249-4) RADIATION GENETICS OF SACCHAROMYCES. Terminal Progress Report. Pittman, David (Southern Illinois Univ., Carbondale). Mar. 1966. Contract AT(11-1)-1249. 93p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Results are reported from a series of genetic studies on Saccharomyces. The principal objectives of the research program were to determine whether or not, under prescribed conditions, hereditary factors of yeast can be transferred to protoplasts treated with lysates of appropriately selected donor strains, and to compare the sensitivity of the intact yeast cell and its protoplast counterpart to x rays and ultraviolet radiation. Results of the genetic studies lead to the conclusion that two types of hereditary factors in yeast can be transferred to protoplasts and recovered in the genetic makeup of intact cells generated from the transformed protoplasts. One factor is extrachromosomal in character and associated with respiratory competence in Saccharomyces. The second factor is best described as a multiple gene complex which may reflect insertion of the total genome of the donor strain into the recipient protoplast. Both factors are transferred independently of each other and may be partially separated by density gradient centrifugation of lysates. Radiation studies showed that protoplasts, when compared with the intact cells from which they are derived, are more sensitive to uv, but more resistant to x rays. Lethality was chosen as the criterion for radiation damage. Delayed lethal effects, scored by time-lapse photography of irradiated material, contributed significantly to the differential sensitivity of protoplasts to either type of radiation. It also appeared that delayed lethals arise from a different type of damage than that descriptive for zero-point lethals. This conclusion was further supported by studies on uv-contrived zero-point and delayed mutations in intact cells, using photoreversal of mutational damage as an additional radiation parameter. The evidence suggests that zero-point and delayed mutations result from two different types of radiation events (adsorbed photons) and that the occurrence of each type depends on the organization of nucleic acids at the time cells are irradiated. (46 references.) (C.H.)

45356 (EUR–2752.e) ACTION OF PADUTIN ON ACUTE AND CHRONIC RADIODERMATITIS. Simon, S.; Massart, A.; Rodesch, J. (European Atomic Energy Community). 1966. 5p. (CONF-650907–4). Dep. mn.

From 11th International Congress of Radiology, Rome.

Deinsulinized pancreatic extracts (Padutin) have a cicatrizing trophic action on torpid wounds. When used in the treatment of acute and chronic radioinduced lesions they give promising results. In man, the treatment of accidental radionecroses and serious effects of radiotherapy gives good results in 80% of cases, failures in 16%, and resistance in 4%. A marked diminution of pain occurs almost immediately. The extreme diversity of radiolesions makes it necessary to draw up a therapeutic plan for each individual case. The treatment period varies from two months to one year. It is helpful to continue administering booster doses. The same treatment can be re-applied successfully should the lesions recur. Positive results were obtained in cases of acute and chronic cutaneous radionecrosis, radiomyositis, radionecrosis of the cervix, bladder, the mucous membranes, and bones, and in instances of delayed cicatrization. (auth)

45357 (EUR-3060.f) LES CELLULES IMMUNOLOGIQUEMENT COMPETENTES. (Immunology Competent Cells). (Association Claude Bernard, Paris (France)). Aug. 1966. Contract 032-64-1 BIOF. 20p. Dep. mn.

Research is reported on: radiosensitivity of immunologically competent cells involved in grafting reactions; relations between neonatal thymectomy and auto-immune reactions; possible transformations of lymphoblasts and allogenic lymphocytes in in vivo hyperbasophilic cells; and sensitivity of cells involved in various immunization reactions to various types of chemotherapy. (auth)

45358 (NP-16208) THE UTILIZATION OF THERMAL NEUTRON FOR SOYBEAN IMPROVEMENT. Final Report. Kwon, S. H., Im, K. H.; Lee, B. H.; Son, U. Y. (Atomic Energy Research Inst., Seoul (South Korea)). Feb. 7, 1966. 19p. Dep. mn.

Dry seeds of two soybean varieties, Kum Kang Dai Rip and Chung Buk Baik, were irradiated with five different dose levels (1, 5, 10, 15, and $20 \times 10^{12} N/cm^2$) of thermal neutrons and additionally two thermal neutron fluxes for studies of germination and seedling height. The study was conducted to select some improved types of soybeans from thermal neutron-irradiated populations, and to determine radiosensitivity of soybean. The germination ability was not changed by thermal neutron irradiation up to $55 \times 10^{12} N/cm^2$, while significant retardation of seedling growth was observed from the flux of $20 \times 10^{12} N/cm^2$ in both varieties. Lower doses had a stimulatory effect in Kum Kang Dai Rip. Results suggested that seedling height seems to be a more appropriate measure of radiosensitivity in soybeans. In the N_1 and N_2 generations, a tendency for delay in maturity was observed with increase in dosage. The mean values of maturity dates were not altered in N_2 generation of variety Kum Kang Dai Rip, and the ranges of distribution and values of standard deviation in irradiated populations were considerably increased in both varieties. The extremely early variety tended toward more delay in maturity as compared to the late variety. The selected plants for shattering resistance in N_1 generation did not show the resistancy in the next generation, and the results imply that the shattering resistancy in irradiated first generation might be due to the temporary physiological effects. Eight highly shattering resistant plants were found from the careful investigation of 8039 plants in the N_2 generation. Some larger seeded mutants were selected in N_2 generation in both varieties. Bacterial blight-resistant mutant was not found in both seedling and mature plant test in N_2 generation. (auth)

45359 (ORNL-P-2407) GASTROINTESTINAL LESIONS IN AGED CONVENTIONAL AND GERMFREE MICE EXPOSED TO RADIATION AS YOUNG ADULTS. Cosgrove, G. E.; Walburg, H. E. Jr.; Upton, A. C. (Oak Ridge National Lab., Tenn.). [1965]. Contract W-7405-eng-26. 23p. (CONF-660917-3). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Gastrointestinal Radiation Injury Symposium, Richland, Wash.

Life span and disease incidence studies on a large number of mice irradiated with single or fractionated exposures with or without treatment and their unirradiated controls have been completed. Sources of irradiation have been 250-300 kvp x-ray machines for x ray, atomic bomb or ^{60}Co sources for gamma rays, and atomic bomb, reactor, Cockroft-Walton, or Po-Be sources for neutrons. Several smaller groups treated with radiomimetics or radiostrontium, or that were irradiated and maintained in the germfree state were also studied. The records of 9634 RF, 5185 LAF_1, and 2507 $1C3F_1$ mice were examined, and primary gastrointestinal (GI) lesions were found in 3.7, 7.2, and 2.9%, respectively. The chief categories were inflammatory (average 3.2%), non-inflammatory (3.4%), or neoplastic (1%). Comparisons made between controls and treated groups in each strain and also between strains, and by type of radiation reveal that with the exception of primary GI neoplasms, GI lesions were less frequent in irradiated than in unirradiated mice. The principal increase in primary GI neoplasms was in neutron-irradiated mice of the LAF_1 strain. There were mouse strain differences in the type of primary GI lesions both in the control and irradiated groups. The GI tract was secondarily involved in more generalized diseases such as amyloidosis, leukemia/lymphoma, and polyarteritis. Strain differences were observed. The number of cases of GI involvement in the generalized diseases varied depending on the effect of the treatment on the incidence of the disease in question. (auth)

45360 (ORNL-P-2435) PHYSICAL ASPECTS OF SEED IRRADIATIONS. Poston, J. W. (Oak Ridge National Lab., Tenn.). [1965]. Contract W-7405-eng-26. 25p. (CONF-660703-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Panel Meeting on the Use of Neutrons in Seed Irradiation, Vienna, Austria.

Energy and spatial distributions of radiation fields, normalization between irradiations, and calculations of absorbed doses to seeds are described. Seeds of 14 species were exposed to the fast neutron spectrum of the HPRR during several different irradiations. (H.L.W.)

45361 (TID-22622) COMPARISON OF PHYSICAL AND CHEMICAL MUTAGENESIS IN MAIZE. Final Report. (Universita Cattolica del Sacro Cuore di Milano, Piacenza (Italy). Istituto di Genetica Vegetale). [1964]. Contract AT(30-1)-2613. 8p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The mutagenic effects of x rays and ethylmethane sulphonate on maize seeds are compared. Damaging effects, such as reduction in number of seeds per ear, are produced by both radiation and chemicals. Differences in the mutations produced by radiation and chemicals are tabulated. Quantitative relationships between two-hit genetic effects and x ray doses in maize were studied. An equation has been formulated to describe the theoretical kinetics for two-hit chromosome aberrations. The relation between x ray induced mutations and chromosome deficiencies is discussed. (H.L.W.)

45362 (TID-23311) ANNUAL REPORT [ON GENETIC EFFECTS OF IRRADIATING SWINE]. (Iowa State Univ. of Science and Tech., Ames. Antigenic Lab.). July 1966. Contract AT(11-1)-707. 37p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Progress is reported on research designed to measure the effects of paternal irradiation on the first generation in swine. Studies during the report period included investigations of: paternal irradiation effects on litter size, sex ratio, and postnatal growth; behavioral parameters in pigs; incidence of gastric ulcer; and assessment of qualitative traits such as erythrocytes, alleles and linkage, the relation between serum amylases and blood groups, serum proteins, gene frequency, and mutation rate. (H.G.D.)

45363 (TID-23347) FINAL REPORT [ON PHOTOPROTECTION AGAINST X-RAY INDUCED DAMAGE], 1966. Clark, J. B. (Oklahoma Univ. Research Inst., Norman). Contract AT(40-1)-2956. 32p. ORAU.

Organisms used in this study were the fungi Nocardia corallina and N. cellulans, the bacteria Mycobacterium rhodochrous, Staphylococcus aureus, Escherichia coli, Sarcina lutea, Gaffkya tetragina, Pseudomonas aeruginosa, and Streptomyces griseus, and the yeast Saccharomyces cerevisiae. Photoprotection against x-ray induced damage has been found in all organisms studied. The maximum protection is found at an x ray dose rate of 300 R/min. There is little or no dose rate dependence in regard to the visible light irradiation. The visible light active in photoprotection is below a wavelength of 450 mu. The x ray induced damage for which protection occurs is oxygen dependent. The degree of protection varies during the growth cycle of the organism. Cells must be undergoing active metabolism when irradiated to be photoprotected. Only part of the cells at any given phase of growth can be photoprotected. Indirect evidence suggests that photoprotection is not the result of visible light selection of x ray resistant cells. It appears to involve a visible light induced change in the cell which makes it more resistant

to radiation, either directly or by enhanced repair after irradiation. (H.L.W.)

45364 (UCRL-16851) SUPER SUPPRESSORS IN SACCHAROMYCES CEREVISIAE. Gilmore, Richard A. (Lawrence Radiation Lab., Univ. of California, Berkeley). May 3, 1966. Contract W-7405-eng-48. 141p. Dep. mn. CFSTI $4.00 cy, $1.00 mn.

Thesis.

Eighty-three multiple-site revertants were induced in a polyauxotrophic strain of Saccharomyces cerevisiae. These super-suppressor-bearing vertants were distributed over eight phenotypic classes. Genetic analyses showed that 44 multiple-site revertants represented a minimum of 17 super-suppressor loci. Comparison of the phenotypic classes of the super-suppressor-bearing revertants induced by x ray and uv showed that these classes are not mutagen-specific. X rays are 3.6 times as efficient as uv for inducing super-suppressor-bearing revertants. One class of revertants is more readily induced by x rays, whereas another class is more readily induced by uv. It is possible that the former are base-pair addition or deletion mutants, whereas the latter are base-pair substitution mutants. A method was devised for determining growth characteristics on solid media. This method was used to study the growth patterns of some of the super-suppressor-bearing revertants. Models of suppressor action are discussed and compared with the results for yeast. A modification of a model involving sRNA is proposed as a possible mode of action. (125 references). (C.H.)

45365 (UCRL-17065) PHYSICOCHEMICAL PROPERTIES OF THE E. COLI F'LAC EPISOME. Freifelder, Dorothy Louise Read (Lawrence Radiation Lab., Univ. of California, Berkeley). Aug. 1966. Contract W-7405-eng-48. 163p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

Thesis.

A technique for the specific labeling of the F'Lac particle of the bacterium E. coli has been developed using a system in which only a transferred particle can replicate and thereby incorporate labeled thymine. The system consists of a male cell which contains a genetic block such that it cannot incorporate exogenous thymine and a female which cannot replicate its own DNA as a consequence of its inability to repair lesions produced by a heavy dose of ultraviolet light. These cells are mated in the presence of radioactive thymine. In this system, the particle is transferred to a killed female with near-normal efficiency and can replicate and be transcribed in the irradiated cell. It was demonstrated by agar-gel chromatography that the labeled material is primarily F'Lac DNA. A rough measurement of the sedimentation coefficient of the labeled DNA has yielded a value of 39 ± 2. From this value the molecular weight has been calculated to be $55 \pm 8 \times 10^6$. A discussion of the possible conformation of the molecule is given. A melting curve of the labeled material has been obtained by agar-gel chromatography; the T_m at an ionic strength of 0.04 is 71°C. These experiments have been repeated in less complete form with the F factor, giving a tentative molecular weight of $35 \pm 7 \times 10^6$. (auth)

45366 (UCSF-10P2-14) ACUTE RADIATION EFFECTS ON STEADY STATE CELL POPULATIONS. Patt, Harvey M.; Lala, Peeyush K. (California Univ., San Francisco. Medical Center). June 1966. Contract AT-11-1-GEN-10. 18p. (CONF-660614-5). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 3rd International Congress on Radiation Research, Cortina, Italy.

This is a review paper in which the effects of radiation on the balance between production and destruction of mammalian cells, such as intestinal epithelial cells and hematopoietic cells, are discussed. Steady state populations are those in which cell production and loss are in dynamic equilibrium. The effect of radiation is to cause first a depletion and then a restoration of the cells in the system. Tissue response to radiation may be greater or less than the combined response of its cell components in isolation. There is some evidence that cells that are maturing but no longer proliferating are relatively unaffected by doses of radiation sufficient to block production. The sequence of depletion and restoration of a cell renewal system will depend on the radiosensitivity of its several components and on its operational structure. The onset of depletion of functional cells after irradiation will depend on the time normally required for completion of maturation of post-mitotic cells. Irradiated proliferating cells may divide a few times before dying and their progeny may give rise to functionally competent mature cells. The number of stem cells required for recovery should be inversely related to their amplification potential provided that the time required for development of the mature functional cell is the same. There is a considerable difference in radiosensitivity of cell populations among different species. For example, the hematopoietic cells of the dog are more sensitive than those of the mouse. (H.L.W.)

45367 LEUKEMIA IN MAN AND MOUSE. Horsfall, Frank L. Jr. (Sloan-Kettering Inst. for Cancer Research, New York). Acta Med. Scand., 179: Suppl. 445, 304-11 (1966).

The role of ionizing radiations, viruses, and carcinogenic chemical compounds as primary incitants in leukemia development is reviewed. Both animal and human studies are considered. The greatest defect in current knowledge of leukemia in man has to do with causal factors, particularly these primary incitants. There is good evidence that a single intense exposure to ionizing radiation ultimately may lead to an increased incidence of leukemia. Among the Japanese atomic bombing survivors a direct relation between the radiation received and the frequency of leukemia induction was noted. It is emphasized, however, that such large doses of radiation are not encountered under ordinary circumstances and that extrapolation of the data to background levels of radiation exposure may not be justified. The question of the contribution, if any, of continuing exposure to so-called background radiation to the incidence of leukemia in man is considered. The fact that acute leukemia is more common among children under 15 years of age than among adults in the same environment casts doubt on the theory that natural exposure to ionizing radiation plays a significant role as a primary incitant. Computations based on currently acceptable hypotheses suggest that background radiation during the normal life span would not be expected to account for more than about 3% of the natural incidence of leukemia in man. (BBB)

45368 ENZYME ACTIVITY IN THE COAGULATED RETINA: A MEANS OF STUDYING THERMAL CONDUCTION AS A FUNCTION OF EXPOSURE TIME. Geeraets, Walter J.; Burkhart, Jean; Gueery III, Dupont (Medical Coll. of Virginia, Richmond). Acta Ophthalmol., Suppl., 76: 79-93(1963).

Histochemical and histological methods were used to study the effects of laser radiation on rabbit ocular tissues. In particular, DPN diaphorase and succinic dehydrogenase activity was studied in the rabbit retina after exposure to various intensities of a collimated, uniform, high-intensity laser beam. It was demonstrated that enzyme inactivation occurs at lower energies than histological alterations or ophthalmoscopically detectable lesions. The histochemical methods used provided a technique by which thermal conduction and its effect on retinal structures could be studied with reference to exposure times. The results indicated that with short exposure times (175 μsec) heat conduction does not contribute significantly to the size of thermal lesions. The margins between active and inactive enzymes are sharp. At relatively long exposures (30 msec) there is a marginal zone of partial inactivation; and the lesion varies in size and uniformity, depending on the intensity of the energy delivered. Conduction by choroidal blood flow is insignificant within the exposure times used in this study. The burn lesion starts in the center of the exposed area and becomes ophthalmoscopically visible. This represents a mild visible lesion. If the energy is further increased, heat generation may become so extensive that after the exposure is already terminated heat conduction to the surrounding tis-

sue may produce similar effects in marginal areas such as those described for long exposure times. (BBB)

45369 IRRADIATION FOR INCREASING WINTER HARDINESS IN OATS. Coffman, Franklin A. (Dept. of Agriculture, Beltsville, Md.). Agron. J., 55: 440-1 (Sept.-Oct. 1963).

Seed of 4 hardy winter oats, Wintok, Forkedeer, Dubois, and Nysel, was x irradiated in 1955 at doses of 20,000 and 30,000 R. During the subsequent 8 years, 3000 selections and reselected lines from irradiated seed, grown in a total of over 7000 rows, were reduced to 15 strains. These few were saved primarily on the basis of superiority in winter hardiness over the untreated control varieties from which they were derived. Some irradiated progeny lines were more hardy than their respective controls. The highest observed 2-yr average increases were 16, 22, and 20% among the Wintok, Forkedeer, and Dubois progeny lines, respectively. No Nysel lines appeared decidedly more winter hardy than the controls. Results for 1962 indicate that only 5 of 15 lines appeared to differ decidedly from their respective controls in 2 or more agronomic characters. The results indicate that irradiation may be of little value as a means of producing more winter hardy oats compared with results obtained through use of hybridization methods using selected parents. (BBB)

45370 EXPERIMENTAL LASER PHOTOCOAGULATION. Zweng, H. C.; Flocks, M.; Kapany, N. S.; Silbertrust, N.; Peppers, N. A. (Stanford Univ., Palo Alto, Calif.). Amer. J. Ophthalmol., 58: 353-62(Sept. 1964).

Pigmented rabbit eyes, cat eyes, and monkey eyes were submitted to laser photocoagulation of the retina, and fundus examinations, photographs and pathologic sections of the eyes were made. The gross appearance of the lesions varied with the amount of light energy absorbed by the pigment epithelium and underlying choroid. Lesions were obtained readily in the pigmented rabbit; about 50% more energy was needed to produce comparable results in the rhesus monkey. Lesions of 0.1-J intensity and 1.0-mm dia demonstrated a vapor bubble in the retina, in the center of the lesion. With energy outputs above 0.12 J, the lesions in pigmented rabbits showed hemorrhages. Pigmentation appeared soon in these lesions, sometimes starting in 24 hr. The histologic lesions produced were very similar to those caused by conventional light coagulation with the principal difference being that the choroid was not as deeply involved in laser lesions. Results with 23 patients with retinal disease treated with the laser photocoagulator are also described. Output energies up to 0.03 J were used on the retina and up to 0.25 J on the iris. (BBB)

45371 INHIBITION OF THE RADIOSENSITIZING EFFECT OF IODOACETIC ACID AND SODIUM IODIDE BY ENDOTOXIN OF SALMONELLA TYPHI. Kertai, Pal; Bianchi, M. Rosaria. Ann. Ist. Super. Sanita, 1: 67-72 (1965). (In Hungarian).

It was observed that the radiosensitizing effect of iodoacetic acid and sodium iodide on rabbit erythrocytes, irradiated in vitro with x rays, was considerably inhibited by Salmonella typhi endotoxin. The inhibition was proportional, within certain limits, to the amount of endotoxin. No inhibitory effect was observed in the presence of starch, glycogen, heparin, chondroitinsulfuric acid, and hyaluronic acid. (auth)

45372 GROWTH OF SHIGELLA Y6R IN THE PRESENCE OF RADIOACTIVE PHOSPHATE AS SOLE SOURCE OF PHOSPHORUS. Guelin, Antonina; Lepine, Pierre (Institut Pasteur, Paris). Ann. Inst. Pasteur, 109: 887-93(Dec. 1965). (In French).

Shigella paradysenteriae Y6R was grown in a synthetic radioactive medium characterized by the absence of protein substances able to protect the germs against irradiation. The whole phosphoric acid of the medium, the only source of P, was replaced by a ^{32}P-phosphate preparation. Thanks to the low specific radioactivity of the phosphate used in the experiments, it was possible to have in the same preparation radioactive (^{32}P) and stable (^{31}P) ions, the latter being absolutely necessary for bacterial growth and survival. Under the conditions of the experiments the survival of radioactive bacteria was longer in the presence of high amounts of ^{32}P. This fact seems to be due to the presence in the preparation of a high amount of ^{31}P ions, these ions playing a part in the protection of the bacterial cell. (auth)

45373 CHANGES IN THE WALLS OF THE GREAT VESSELS OF THE NECK INDUCED BY ROENTGEN RADIATION. EXPERIMENTAL RESEARCH ON THE RABBIT. Carbone, A. M.; Calzavara, F. (Univ., Padua). Ann. Laringol. Otol. Rinol. Faringol., 63: 453-7(1964). (In Italian).

Histologic studies were made in rabbits subjected to local doses of x rays in the neck region. The first group of animals received a local, 2000 R dose in 10 fractions of 250-kv x rays over 6 × 8 cm bilateral fields. Some animals were sacrificed at the end of the irradiation course and others 3 months later. A second group of rabbits similarly received a total dose of 4000 R in 20 fractions. The carotid artery and jugular vein were examined. When seen after the 2000 R dose, endothelial hyperplasia and adventitial edema were prominent, but both had disappeared at the end of 3 months. In the early lesions after 4000 R, separation between the intimal and muscular layers was present, and periadventitial capillaries were hemorrhagic. After 3 months, endothelial hypertrophy and connective tissue hypertrophy in the outer vascular layer were evident. Thus, the 2000 R dose resulted in reversible lesions, whereas the 4000 R dose did not. The high-dose lesions resulted in fibrosis of the vessel walls. This was apparently an end-result of the inflammatory changes caused by irradiation. (BBB)

45374 EFFECT OF WHOLE-BODY IRRADIATION ON BARBITURATE METABOLISM IN SUCCESSIVE GENERATIONS ON MICE. Wade, A. E.; Ansel, H. C. (Univ. of Georgia, Athens). Arch. Int. Pharmacodyn., 162: 104-31 (July 1966).

A study was undertaken to determine whether low-dose γ and neutron irradiation of male mice would produce genetically transferable radiation injury which would affect the drug (pentobarbital) metabolizing ability of offspring resulting from matings with their nonirradiated sisters. Group I male BALB/c mice received no irradiation and served as controls. For generations one through 3, Group II males received 100-R ^{60}Co γ radiation; Group III, 200-R γ radiation; Group IV, 100-rem neutron radiation; Group V, 200-rem neutron radiation, Group VI, 50-R γ plus 50-rem neutron radiation; and Group VII 100-R γ plus 100-rem neutron radiation. For fourth generation mice, neutron dosage was increased from 100 to 250 rem; from 200 to 541 rem; and from 50 to 128 rem. All other radiation treatment was the same as for previous generations. The irradiation treatments imposed through four generations did not produce lasting effects on growth rate. There were no significant differences in the LD_{50} of pentobarbital for any of the experimental groups of male mice from those of their respective control groups in generations 2, 3, and 4. In females, the LD_{50} of Groups II, III, IV, and V of the fourth generation indicated that those mice were significantly more susceptible to the toxic effect of pentobarbital than the control mice of this generation. However, when male and female mice data were combined and the LD_{50} values calculated, only Group IV mice (which received 250-rem neutron irradiation) were significantly more susceptible to pentobarbital toxicity than the controls. This effect may have resulted from some unknown variant in treatment since the effect was not dose dependent, i.e., those mice receiving twice this dose of neutron irradiation did not have greater alterations in LD_{50} values. If a given regimen of radiation treatment were to affect specifically one gene or set of genes, a cumulative effect would be expected to occur in the subsequent generations. When the toxicities of pentobarbital in the various generations were compared these effects did not appear to be cumulative and no trend in susceptibility or resistance developed. (BBB)

45375 OCULAR EFFECTS OF RADIATION AND PHOTOCOAGULATION: A STUDY OF 100 GLOBES WITH

RETINOBLASTOMA, SOME OF WHICH WERE TREATED PRIOR TO ENUCLEATION. Howard, George M. (Columbia-Presbyterian Medical Center, New York). Arch. Ophthalmol., 76: 7-10(July 1966).

The effects of x irradiation and photocoagulation on the tumor-bearing eyes of 100 children were examined. The infant eye tolerates an initial course of 3500 R of x radiation in divided doses. When a second similar course of radiotherapy is given because of new or recurrent tumor in an only eye, a characteristic radiation syndrome becomes clinically evident in most patients three to six months afterward. Sheathing and occlusion of the arterioles begin in the posterior pole followed by speckled retinal pigmentation, retinal neovascularization, recurrent vitreous hemorrhages, rubeosis iridis, and elevated ocular tension. In spite of the heavy doses of radiation, the lens remains clear provided that the beam is directed to the posterior segment during radiotherapy. Microscopic examination of the eyes enucleated following heavy doses of x radiation revealed a fibrovascular membrane on the anterior surface of the iris, synechial closure of the angles, sclerosis and shrinkage of the choroidal vessels, retinal atrophy and thickening, and hyaline degeneration of the walls of the retinal vessels. These changes were present in 71% of eyes which had received two courses of radiotherapy directed at the posterior segment (doses averaging 8420 R), and in 15% of eyes which had received one course (doses averaging 3750 R). The differences between eyes which had been heavily irradiated and which had not been were quantitative rather than qualitative. (BBB)

45376 THROMBOELASTOGRAPHIC RESEARCH OF BLOOD CLOTTING IN RATS CHRONICALLY EXPOSED TO X RAYS. Visnjic, V.; Vidakovic, A.; Panov, D. (Inst. of Occupational Medicine, Belgrade). Arh. Hig. Rada Toksikol., 17: No. 1, 49-54(1966). (In Croatian).

The effects of x-irradiation on blood clotting were studied in rats exposed for 14 or 15 weeks to integral doses of 280 to 300 R. Thromboelastography revealed no changes in blood coagulation in the irradiated animals. (TSS)

45377 OSMOTIC RESISTANCE OF LEUKOCYTES FOLLOWING FRACTIONATED X IRRADIATION OF RATS. Kilibarda, M.; Markovic, B.; Zivancevic, S.; Panov, D. (Inst. of Occupational Medicine, Belgrade). Arhiv Hig. Rada Toksikol., 16: 353-6(1965). (In Croatian).

Whole-body irradiation in rats exposed to x rays 1 R per min, 3 mA 70 kV for 20 minutes weekly for 20 weeks was followed by a progressive fall in osmotic resistance and longevity of white blood cells. (JPRS)

45378 REACTIVE PROCESSES IN THE BRAIN IN CHRONIC LOCAL IRRADIATION. Dimant, I. N.; Abdurasulov, D. M.; Stolyarova, A. G.; Loktionov, G. M.; Sataev, M. M. Arkh. Anat., Cistol. Embriol., 48: 84-90(1965). (In Russian).

The experiments conducted on rabbits and dogs with intracerebrally implanted granules of ^{60}Co revealed a phasic character of reactive changes in the cerebral tissue. Irregular hyperplasia of different glial fractions with formation of multicentrally located focal proliferates of the glial and mesenchymal elements, bearing signs of cellular atypism were observed in the brain of the animals under study. The changes are of preblastomatous character and were found mostly in the subependimal zone and in the white matter of the cerebral hemispheres. (auth)

45379 PROPERTIES OF NEUTRONS AND NEUTRON SOURCES FOR BIOLOGICAL PURPOSES. van der Feer, Y. Atoomenergie Haar Toepass., 8: 122-9(June 1966). (In Dutch).

The interactions between neutrons and matter were described. A review was given of practical neutron sources. (tr-auth)

45380 THE PROCESS OF RESTORATION AFTER IRRADIATION OBSERVED AT THE ORGANISM, TISSUE, AND CELL LEVELS. Zedguenidze, G. A. (Inst. of Medical Radiology, Academy of Medical Sciences, USSR). Biol. Med. (Paris), 54: 379-401(July-Aug. 1965). (In French).

A review of Russian literature is given of the processes concerned in the recovery of function and structure of organs and organ components of irradiated animals. The probable site of the primary cellular lesion is discussed, and the chain of secondary reactions is considered. Clinical findings in irradiated animals are described in relation to these fundamental processes. The author's studies on renal function in irradiated animals are outlined. These show that complete kidney function requires 2 to 3 months to be re-established after acute radiation disease. Response of various tissue to different interventions in the postirradiation period are described, such as with burns and hemorrhage. Postirradiation studies of tissue regeneration as seen microscopically are surveyed. Bone changes, examined radiographically, are shown in Thorotrast-injected rabbits; progressive lesions and osteoporosis were evident. Later development of osteosarcoma in these rabbits is also documented. Repair at the cellular and subcellular level is also considered. (BBB)

45381 SEVERAL LIPID FRACTIONS IN IRRADIATED RATS MAINTAINED ON VARIOUS DIETS. II. Nemec, Rudolf; Eichnerova-Laginova, Viera (Inst. of Oncology, Bratislava). Biologia, 21: 118-27(1966). (In Czech).

Cholesterol, phospholipids, and iodine number were evaluated in rats maintained on various diets containing different amounts of unsaturated fatty acids and treated with a single whole-body dose of 600 R of x radiation. The changes in lipid fractions were compared between diets for the first few days after irradiation. Diets with lower concentrations of unsaturated fatty acids had a greater ability to protect the animals against irradiation injury than did diets at the higher levels. The lower level of unsaturated fatty acids amounted to 6%, and the higher level amounted to 10% concentration by wt in the diets. The effects observed may have been due to an increased stability of these fatty acids against the irradiation effect, which was reflected in increased stability of the lipid functions measured and possibly decreased formation of injurious peroxides or other irradiation products. (BBB)

45382 RENAL RADIATION LESIONS AND EXPERIMENTAL RADIOCARCINOGENESIS BY LOCAL IRRADIATION OF THE KIDNEY OF MICE. Maldague, P.; Duplan, J.-F. (Institut du Cancer, Louvain, Belg.). Bull. Ass. Franc. Etude Cancer, 52: 309-24(Oct.-Dec. 1965). (In French).

Mice were irradiated with local, 1600-R doses of 250-kv x rays, using a 1-cm aperture in a lead shield to expose only the left kidney. Histopathologic examination of the irradiated kidney showed loss of epithelium of the glomerular capillaries and hyalinization of these vessels. The epithelial cells of the convoluted tubules were desquamated when observed 200 days after irradiation. Two types of cells participated in the regeneration of these tubules: cells with a large, probably polyploid, nucleus and small cells with small nuclei deficient in mitochondria. Kidneys examined 18 months after irradiation showed polycystic, micro-adenomatous formations, but even after 20 months no evidence of neoplasia was seen. This is contrary to findings in the rat. The irradiated nephrons ceased to function, and early death occurred when these mice were submitted to right nephrectomy. Sarcomas developed in the peritoneum of 21% of mice injected with mitomycin C before irradiation of the left kidney, but were not seen in animals which were injected with this agent but not irradiated. (BBB)

45383 OBSERVATIONS ON THE MORPHOGENETIC POTENTIALITIES OF IRRADIATED TISSUES OF CORDYLOPHORA CASPIA (PALLAS). Diehl, Fred A. (National Inst. of Health, Bethesda, Md.); Bouillon, Jean. Bull. Cl. Sci., Acad. Roy. Belg. (5), 52: 138-46(1966). (In French).

The morphogenetic reactions of isolated coenosarc, ectoderm, and endoderm fragments of Cordylophora caspia were studied before and after x irradiation. It is

shown that the healthy ectoderm alone can regenerate the hydranth and the colony, and that it is still competent when irradiated if it is associated with the healthy endoderm. (tr-auth)

45384 CELL CYCLE AND EFFECTS OF X IRRADIATION ON GERM CELLS OF RAT INCISORS. PART I. Sasaki, Takehito (Tokyo Medical and Dental Univ.). Bull. Tokyo Med. Dent. Univ., 12: 379-402(Dec. 1965).

The time of each phase in cell cycle of the tooth germ cells (internal enamel epithelial cell and pre-odontoblast) of rats was determined and the effects of x irradiation on the cell cycle was measured by means of an autoradiographic method with tritiated thymidine. Upper incisors of rats (Wistar strain) were used as materials. Generation times were estimated to be 27.3 hours in internal enamel epithelial cells and 25.3 hours in pre-odontoblasts, respectively. Both labeling index and photographic grains per cell on autoradiograms were markedly decreased in internal enamel epithelial cells and also in pre-odontoblasts as early as one half hour after a single exposure to 1,200 R of x irradiation. (auth)

45385 SENSITIVITY OF BUNODACTIS ASIATICUS UCHID TO ^{60}Co γ RADIATION. Li, Yung-ch'i; Hu, Tseng-miao; Fang, Tsung-hsi. pp 113-14 of Chung Kuo Hai Yang Hu Chao Hsueh Hui 1963 Nien Hsueh Shu Nien Hui Lun Wen Chai Yao Hui Pien. Peking, 1964. (In Chinese).

Bunodactis asiaticus Uchid obtained from intertidal zones were cultivated for two days prior to application of ^{60}Co gamma rays at 125 R/min. Doses of 3000, 5000, 7000 and 20,000 R were used. Animals were placed in a tank of flowing sea water for daily observation. Results showed that 20,000 R was the $LD_{100/30}$ dose for these organisms. Histological studies in the 20,000 R group revealed swelling of the ectoderm. However there were no signs of swelling in the endodermal and mesodermal layers (sic). (TSS)

45386 ALTERATIONS INDUCED BY X RAYS IN CHROMOSOMES OF MERISTEMATIC CELLS OF VICIA FABA ROOTS. I. TECHNICAL ASPECTS. Villalobos-Pietrini, R. Com. Nac. Energia Nucl. (Mex.), [Publ.], No. 196, 178-86(Oct. 1965). (In Spanish).

The use of a new method of fixation-staining by adding Janus green B to an aceto-orcein solution and the employment of siliconized material permitted the attainment of permanent slides with well contrasted and scattered chromosomes, thus facilitating the analysis of ruptures and rearrangements produced by x radiation in meristem cells of Vicia faba roots. (auth)

45387 RADIOSTIMULATION AND INHIBITION OF PEAS BY IONIZING IRRADIATION. Vassileva-Dryanovska, O.; Izvorska, N. Compt. Rend. Acad. Bulgare Sci., 18: 565-8(1965).

The reaction of earliest-of-all, Moskovskii garden varieties and the fodder variety of peas (dry, germinated, or bloated) to fast neutron and gamma radiations were compared. Comprehensive tabulated data show that the stimulating effect is manifested differently for the dry and bloated seeds with regards to the yields, both in the initial phases of the development of the plants up to certain doses as well as in the final phase. The three varieties of peas, in their different seed states react differently to the two types of irradiation. The stimulation or inhibition resulted as an interplay of numerous factors. In general, rapid neutron exposure generated larger inhibiting effects than exposure to gamma rays. Most resistant to both types of radiation was the Moskovskii variety. The vitamin C content seemed to increase the range of inhibiting doses. (JPRS)

45388 EFFECTIVENESS OF SELECTION FOR QUANTITATIVE CHARACTERS IN THE THIRD GENERATION FOLLOWING IRRADIATION OF SOYBEAN SEEDS WITH X RAYS AND THERMAL NEUTRONS. Papa, Kenneth E.; Williams, J. H.; Hanway, D. G. (Nebraska Agricultural Experiment Station, Lincoln). Crop Sci., 1: 87-90(1961).

The third generation of two soybean populations (Hawkeye and Adams varieties) following irradiation of seed with x rays and thermal neutrons was sampled to determine the effectiveness of selection for the quantitative characters: yield, maturity, seed weight, oil content, and protein content. Generally, more variation existed in the irradiated than in the nonirradiated populations for most of the characters studied. Selection for high yield was effective in both the irradiated and nonirradiated Hawkeye populations but was ineffective in the Adams variety. Although a selection advantage existed for yield in the irradiated populations, the amount of gain was hardly enough to compensate for the lower initial yield of the irradiated as compared to the nonirradiated populations. Several high yielding progenies were observed that possessed additional desirable qualities. For the more highly heritable characters, maturity, seed weight, oil content, and protein contents, selection was generally more effective in the irradiated than in the nonirradiated populations. Significant gains from selection were made in nearly all of the irradiated populations. Comparisons of observed and predicted gains from selection were made. Fairly good agreement was obtained between observed and predicted values for the irradiated populations in the Hawkeye yield test. For the other characters studied, significant gains from selection were made; however, they were considerably less than the predictions. (BBB)

45389 EFFECTS OF ULTRA-VIOLET RAYS ON SAPROPHYTIC AND PHYTOPATHOGENIC MICROFLORA OF WINTER RYE SEED. Zhdanova, E. B. Dokl., Moskov. Sel'skokhoz. Akad., 98: 211-16(1964). (In Russian).

A distinct depression was observed in the surface microflora of winter rye seed exposed to ultraviolet light. After a 5 min exposure the number of fungal spores was decreased 4 to 5 times, and only 2.8 to 6.2% of the spores survived a 60 min exposure. Subepidermal flora of winter rye were not affected by uv. Ultraviolet radiation stimulated development of Claviceps purpurea spores. (H.G.D.)

45390 INFLUENCE OF BURN TRAUMA ON THE COURSE OF EXPERIMENTAL SUBACUTE RADIATION SICKNESS. Perov, S. A. Eksp. Khir. Anesteziol., No. 2, 46-8(Mar.-Apr. 1965). (In Russian).

Burn trauma applied during the developmental period of the phase of temporary compensation of subacute radiation sickness (overall radiation dose 720 rads) is accompanied by pronounced leukocytosis, while under conditions of chronic radiation disease (at the same overall radiation dose), the leukocytic reaction for the same area and depth of burn is sharply reduced or lacking altogether. Application of a burn during the phase of pronounced hematological changes (overall radiation dose 1,560 rads) produces substantial aggravation of radiation sickness, the syndrome of mutual aggravation is clearly evidenced in one-fourth of the animals; one of eighteen healthy non-bred male dogs succumbed. The leukocytic reaction to burn is severely inhibited or lacking, lymphopenia, hypo-, and dysproteinemia being increased in intensity. (JPRS)

45391 NODULATION OF MEDICAGO SATIVA PLANTS FROM X-RAY-IRRADIATED SEEDS. Visona, L.; Vanossi, Este S.; Caprotti, M. (Univ., Pavia, Italy). Genet. Agr., 18: 641-69(1965). (In French).

Two local strains (Cremonese and Massinigo) and one variety (99/100) of Medicago sativa, are differentially affected by x-ray treatment when symbiosed with Rhizobium melitoti. Doses of 90 kR had a clear-cut negative effect on nodulation in the three populations, but 60 kR affected only the 99/100 variety. Mortality continued to be correlated with dosage. The effect of radiations in presence of β-indolylacetic acid (ABIA) was examined only on the strain Cremonese. Mortality agreed with the correlation dosage mortality previously found. Plants inoculated or treated with ABIA are more radiosensitive than plants not inoculated or grown without auxin. A correlated increase in the number of nodules and the development of rootlets is statistically significant only among surviving plants. (auth)

45392 ANALYSIS OF A STICKY MUTATION INDUCED BY RADIATION IN CAPPELLI DURUM WHEAT. Martini,

G.; Bozzini, A. (Univ., Pisa, Italy. CNEN, Rome). Genet. Agr., 19: 184-94(Oct. 1964). (In Italian).

After thermal neutron irradiation of caryopses of durum wheat a completely sterile but phenotypically normal progeny was isolated in the M_2. Genetic analysis carried out on 4 generations showed that this sterility factor is monogenic and recessive. The cytological analysis of the microsporogenesis identified the cause of the sterility as a form of chromosomic agglutination (stickiness) of great intensity affecting all meiotic stages. No cytological analysis of mitotic division was made since the homozygous sticky plants looked quite normal. It is supposed that the stickiness will not affect mitotic divisions as much as it affects meiosis. Microsporogenesis, pollen fertility, and the average number of caryopses per spikelet of the plant heterozygous for the sticky factor, were normal. (tr-auth)

45393 RADIOSENSITIVITY OF SIX HORTICULTURAL SPECIES. Cavazza, L.; Guerrieri, G.; Pacucci, G.; Scarascia Mugnozza, G. T. (Univ., Bari, Italy. CNEN, Rome). Genet. Agr., 19: 243-62(1965). (In Italian). (RT/BIO-(65)29).

The radiosensitivity of six horticultural species (cauliflower, lettuce, cucumber, pepper, pea, and tomato) was examined in terms of germinability, survival at seedling stage, and mean dry weight per seedling. For each species five cultivars were investigated. Seeds were treated with x rays after conditioning at normal moisture. Significant survival differences among cultivars of all species except tomato were observed; moreover, in four species (cauliflower, lettuce, pepper, pea) the behavior of cultivars with regard to doses was found to be significantly different. Calculation of LD-50 on survival data, by the estimation of probits regression, showed that in cauliflower, pepper, and lettuce the LD-50 differs by factor of two or more. Relative uniformity was found in cucumber (51.8; 57.34 kR) and tomato (60.8; 68.2 kR). Since differences among cultivars of the same species seem clear-cut and often very relevant, it is concluded that, in order to use correct doses in radiogenetics research it is first necessary to ascertain whether radiosensitivity differences exist among genotypes of the same species. This conclusion is strengthened by the fact that the LD-50 values observed in this experiment frequently differed from those found by other authors. (auth)

45394 REPRODUCTIVITY AND LIFE SPAN OF MOUSE POPULATIONS FROM 25 GENERATIONS OF IRRADIATED SIRES. Spalding, J. F.; Brooks, M. R.; McWilliams, P. (Los Alamos Scientific Lab., New Mex.). Genetics, 54: 755-61(Sept. 1966). (LA-DC-7835).

Reproductive fitness (comparative litter data studies) and life span of nonirradiated offspring from 25 generations of x-irradiated mouse progenitors was studied. Irradiated line mice showed decrements in fitness by producing and weaning fewer progeny, by exhibiting a greater tendency toward cannibalism and sterility, and by producing stillbirths in greater numbers than control line mice. Life span was not significantly changed by progenitor irradiation. (auth)

45395 GENETIC EFFECTS OF RECURRENT IRRADIATION IN DIPLOID AND POLYPLOID TRITICUM SPECIES. Kao, Fa-ten; Caldecott, Richard S. (Univ. of Minnesota, St. Paul). Genetics, 54: 845-58(Sept. 1966).

Dormant seeds of the tetraploid (T. durum) and hexaploid (T. aestivum) species of Triticum were repeatedly irradiated with x rays for six consecutive seed generations, and the diploid species (T. monococcum) for two generations. Two x-ray dosages were used for each species. Some of the seeds obtained from each irradiated cycle were grown to mature plants and examined for chromosome interchanges at microsporogenesis. After each cycle of irradiation, the seeds from several spikes of each plant were screened in the greenhouse to determine the incidence of chlorophyll mutations. Following the first cycle of irradiation, there was a sharp decrease in mutation frequency as the ploidy increased. After the second cycle, the number of mutants detected was greatly increased in the tetraploid, although no increase was found in the diploid. Subsequent irradiation treatments of the tetraploid did not result in an increase in the mutation frequency, but maintained a frequency corresponding to that observed in the diploid. In the hexaploid, chlorophyll mutants were not detected in a significant frequency until after the third cycle of irradiation. Segregation data were obtained in the F_2, F_3 and X_3 generations of a number of mutant lines in the tetraploid and hexaploid species, which suggest that recurrent irradiation is an effective means of inducing mutations in duplicate genes. These data also indicate that, during the evolution of the species, diploidization occurred through spontaneous mutation because segregation ratios of 3:1 were commonly found in the tetraploid species and 3:1 and 15:1 ratios were found in the hexaploid. The kinds of mutations detected were generally comparable for all three species except that the yellow mutant class, which was found relatively frequently in the diploid, was not observed in the tetraploid and hexaploid. In all three species, the albino mutant class constituted approximately 50% of the total mutants observed, and the class combining light green and yellow green phenotypes constituted about 25%. Cytological analyses of the tetraploid and hexaploid species revealed that selection, based on spike fertility, against the build-up of reciprocal translocations in the populations was ineffective and that the incidence of chromosome interchanges increased as the number of cycles of irradiation increased. (auth)

45396 REPRODUCTIVE DEATH OF MAMMALIAN CELLS DUE TO BETA-RADIATION FROM INCORPORATED THYMIDINE LABELLED WITH ^3H OR ^{14}C. Berry, R. J.; Oliver, R.; Reiskin, A. B. (Radiobiology and Physics Labs., Churchill Hospital, Oxford). Health Phys., 12: 1461-6(Oct. 1966).

Survival of mammalian cells cultured in vitro has been determined following incorporation of thymidine labelled with ^3H or ^{14}C. Survival decreased with increase of concentration in the medium (μC/ml) and also with thymidine specific activity (mC/μmole), the latter effect being much greater at higher concentration levels. After 48 hr incubation at a concentration of 0.05 μC/ml at a specific activity of 2 mC/μmole, there were no surviving cells capable of forming colonies. Approximately the same survival was obtained with ^3H- and ^{14}C-thymidine for the same concentration of 0.5 μC/ml at a specific activity of 0.03 mC/μmole and estimates show that, because of the different particle ranges for the two isotopes, the nuclear radiation dose would be similar under these conditions. The possible hazard of ^3H thymidine at very high specific activity is emphasized. (auth)

45397 CARCINOGENIC AGENTS IN LUNG CANCER. Small, C. S. (Christian Medical Coll., Vellore, India). Indian J. Cancer, 2: 92-102(June 1965).

Various possible etiologic factors in lung cancer, including ionizing radiations, endocrine factors, air pollution, and tobacco smoking are reviewed. Evidence for the carcinogenic action of ionizing radiations includes early reports from the uranium mines in Joachimsthal and Schneeberg in Eastern Europe where radioactivity was apparently responsible for lung cancer induction. From 40 to 75% of miners who died had lung carcinoma. Lung cancer deaths per 1000 Schneeberg miners was 16.5% and cancer in other sites 2.1. Controls in Vienna had 0.34 lung cancer deaths per 1000 per year and 2.1 in other organs. It is estimated that the 10-yr dose in Joachimsthal miners was 600 rad, but due to selective concentration by cilia, the dose may have been 10,000 rad at some places. Tobacco smoke contains a small amount of radioactive material but less than 1% of that in air itself. However, there is little evidence that atmospheric radioactive materials have an influence on the incidence of lung cancer. Animals bearing intrabronchial implants of radioactive material have been shown to develop squamous cell carcinoma of the lung, the incidence correlating with dose. This finding correlates well with the fact that uranium miners in Colorado have four times as much lung cancer as the general population nearby. Other carcinogens which are more likely to be implicated in genesis of lung cancer are also reviewed. (BBB)

45398 COMPARISON OF RETICULOCYTE PICTURES IN RAT IN HAEMORRHAGE AND RADIOPHOSPHORUS POISONING. Lahiri, S. K.; Udupa, K. B.; Jamdar, S. C.; Banerji, D. N. (Saha Inst. of Nuclear Physics, Calcutta). Indian J. Exp. Biol., 4: 95-6(Apr. 1966).

Blood and bone marrow reticulocyte responses in rats after hemorrhage and ^{32}P poisoning were compared. Reticulocyte response in bone marrow after hemorrhage is regular and is associated with immediate response in blood, both lasting for about a week. Phosphorus-32 poisoning at a high dose causes an immediate reticulocyte response in bone marrow, but the blood reticulocyte rise is lagged indicating a block in the reticulocyte release. At a dose of 4.5 $\mu C/g$ body weight, the bone marrow reticulocyte count drops to subnormal levels within 3 days and gradually reduces to extremely low values. The blood reticulocyte percentage, however, remains above normal level, indicating larger reticulocyte release. This excess release of reticulocytes in spite of extremely low reticulocyte count in bone marrow suggests defective erythropoiesis producing degenerate RBC whose survival times are small, and which suffer quick destruction. This destruction, and presumably hemolysing conditions lead to anemia. Bone marrow recovery starts by about 2 weeks and is well advanced by 3 weeks. (auth)

45399 IRRADIATION OF FEMALE MICE AND ITS EFFECT ON OSSIFICATION IN NEWBORN YOUNG. Kodikal, Lalita G.; Batra, B. K. (Indian Cancer Research Center, Bombay). Indian J. Exp. Biol., 4: 97-8(Apr. 1966).

Radiation effects on the skeletal system of the immediate progeny of the female mice (strain, C57) treated with 300 R, prior to their mating, were studied. Progeny of treated animals exhibit reduction in the number of ossified phalanges in each digit as well as reduction in the ossified tail vertebrae and tarsals. Retarded ossification of pelvic girdle and skull of various degrees was also observed. (auth)

45400 RADIOMIMETIC AND RADIOSENSITIZING EFFECTS OF 5-BROMOURACIL AND 2-AMINOPURINE IN ROOT MERISTEMS OF BARLEY AND ONION. Kaul, B. L.; Natarajan, A. T. (Indian Agricultural Research Inst., New Delhi). Indian J. Exp. Biol., 4: 109-13(Apr. 1966).

Cytological effects of 5-bromouracil (5-BU) and 2-aminopurine (2-AP) alone and together with x rays were studied in onion and barley. Growing roots of onion treated with 5-BU for 12 hrs inhibits the cell division from 50 to 80 per cent of control; optimum time to effect inhibition is 8 hr. X rays alone or in combination with 5-BU cause an immediate reduction in cell division. Treatment with 5-BU alone induces simple chromosome breaks, but when the same is followed by x rays a significant rise in types of aberrations as well as in the total yield of aberrations is achieved. The effects of both 5-BU and 2-AP were studied in barley. X-irradiation, on seeds either wet, i.e., immediately after base analogue treatment is over or after the seeds are dried back, shows radiosensitization effect only in wet system. (auth)

45401 RELATIVE ABSORPTION OF THERMAL ENERGY IN RETINA AND CHOROID. Geeraets, Walter J.; Williams, R. C.; Chan, Guy; Ham, William T. Jr.; Gueery III, DuPont; Schmidt, Frederick H. (Medical Coll. of Virginia, Richmond). Invest. Ophthalmol., 1: 340-7 (June 1962).

Detailed knowledge of the sites of energy absorption in the ocular fundus was sought to evaluate the ocular hazards from nuclear explosions and to exploit the clinical application of laser-induced coagulation in the ocular fundus. The absorption of light energy in three pigmented structures of the ocular fundus was studied: the retinal pigment epithelium, the randomly distributed pigment cells in the choroid, and intravascular blood pigments. Energy absorption within the spectral range 350 to 1500 mμ was measured separately for the pigment epithelium and the choroid on 24 human eyes, and the influence of intravascular blood pigments on light absorption in 80 albino rabbit eyes was examined. Results showed that the production of thermal lesions in the ocular fundus depends upon the spectral quality of the light incident on the cornea, and the energy-density gradient in the fundus. The latter depends, in turn, upon the concentration of pigment within the granules and the space distribution of the granules within a given stratum or layer. The distribution of pigmented granules varies in both pigment epithelium and choroid, but most markedly in the latter. Absorption of radiant energy in pigment epithelium may be greater than in the choroid or vice versa depending upon the individual. It is estimated that the blood pigments absorb approximately 10% of the light incident on the human cornea. Energy absorption in the retinal pigment epithelium is the most important factor leading to the development of mild or so-called threshold burns. (BBB)

45402 EXCRETORY PROCESSES OF THE STOMACH OF IRRADIATED DOGS OPERATED BY PAVLOV AND HEIDENHAIN METHODS. Zakharyan, A. P. Izv. Akad. Nauk Arm. SSR, Biol. Nauki, 17: 85-92(1964). (In Russian).

Urea and chlorides in gastric juice and blood and excretion of neutral red were determined in x-irradiated (800 R) dogs with Pavlov or Heidenhain stomachs. Irradiated dogs with Pavlov stomachs showed an initial sharp decrease in gastric juices and excretion of neutral red. Gastric and hematologic urea decreased sharply. Excretion of neutral red ceased in terminal stages of radiation sickness and gastric hemorrhage occurred. Secretion of gastric juices and neutral red excretions doubled in dogs with Heidenhain pouches, but urea remained unchanged throughout. No significant change was noted in the gastric juice chlorides. (H.G.D.)

45403 INTERACTION OF DONOR AND HOST LYMPHOID CELLS IN THE PATHOGENESIS OF RENAL CORTICAL DESTRUCTION INDUCED BY A LOCAL GRAFT VERSUS HOST REACTION. Elkins, William L. (Naval Medical School, Bethesda, Md.). J. Exp. Med., 123: 103-18(Jan. 1, 1966).

Experiments using whole-body and locally irradiated rats were done to clarify the pathogenesis of the graft-vs-host reaction (GVHR) which develops in hybrid rat kidney after the local inoculation of parental strain lymphoid cells. The GVHR, which results from the injection of parental strain spleen cells beneath the kidney capsule of F_1 hybrid rats, is transferable during its developmental phase into F_1 hybrid hosts isogeneic with the primary host, but not into secondary hosts of the parental (donor) strain. Furthermore, the GVHR propagates but rarely in secondary hybrid hosts which are allogeneic with respect to the primary hosts, but which are also genetically tolerant of donor-type cells. These findings indicate that the donor cells not only initiate the GVHR but also maintain it by virtue of immunologically specific activity. Whole-body ^{60}Co irradiation of (LBf)F_1 and (LBN)F_1 hosts 24 hr prior to injection of parental (L) spleen cells results in inhibition of the subsequent GVHR to a degree commensurate with the radiation damage sustained by the lymphoid system of the host. Furthermore, propagation of the transferred GVHR did not occur if susceptible secondary hybrid hosts had been previously irradiated. These findings indicate that radiosensitive host cells play a continuing and essential role in the pathogenesis of the invasive-destructive lesion. It is concluded that the development of this lesion depends upon the continuous interaction of the specifically reactive donor-type cells with an immunologically nonspecific population of host mononuclear cells. (BBB)

45404 LASER EFFECT ON DENTAL HARD TISSUES: A PRELIMINARY REPORT. Stern, Ralph H.; Sognnaes, Reider F. (Univ. of California, Los Angeles). J. S. Calif. State Dent. Ass., 33: 17-19(Jan. 1965).

The effect of laser radiation on enamel, dentin, and certain restorative materials was studied in extracted human teeth. Intensive laser beam exposure focused on a small area affects enamel by causing the formation of a crater. The crater which forms when intact enamel is exposed to a laser beam has a pointed floor and a rounded

lip. The enamel on the lip of the crater has a glass-like fused appearance. It is not certain yet whether laser alters larger units, as between whole enamel prisms, or if there is initial fusion of individual inorganic crystals. Evidently, the structure does not become entirely amorphous since laser-exposed enamel retains some of its crystallographic properties. When intact dentin was exposed to a laser beam, comparable energies burned a more definite crater, which, due to its higher organic content, showed evidence of charring. The reflecting power of dental enamel causes considerable laser beam deflection, which reduces its ability to be lasered. The effect of laser on a dental restorative metal was examined by exposing the margin of a gold foil restoration to the beam. The metal absorbed much more energy than the enamel, resulting in considerably greater destruction of the metal. The difference in energy dissipation and related theoretical calculations suggests that limited pulpal temperature changes take place when the surface enamel is exposed to the laser beam. (BBB)

45405 SMALLER G CHROMOSOME IN IRRADIATED MAN. Goh, Kong-oo (Oak Ridge Associated Universities, Tenn.). Lancet, 659-660(Mar. 19, 1966).

Cytogenetic analyses in three of eight men accidentally exposed to whole-body mixed γ and neutron doses ranging from 68.5 to 339 rads 84 months previously revealed abnormalities in the metaphases obtained from the bone-marrow and peripheral-blood leukocyte cultures at different intervals after in vitro incubation with phytohaemagglutinin. In 18 (2.5%) of metaphases, a smaller G chromosome was observed. Futhermore, chromatid and chromosomal breakages were seen in 30 and 105 chromosomes respectively. Of these, a chromosomal or chromatid break involving one of the G chromosomes was seen in six (4.4%) of the chromosomes, suggesting that metaphases with the small G chromosome found in these patients probably evolved from the metaphases with a chromatid or chromosome break. The model chromosome number was 46, which was seen in 83% of the metaphases analyzed. (C.H.)

45406 GENETIC STUDY OF THE IRRADIATED JAPANESE POPULATION. Med. J. Austral., 2: 995-6(Dec. 14, 1963).

A brief review and interpretation is given of genetic findings in Japanese populations of Hiroshima and Nagasaki exposed to atomic bombings. Indicators reflecting the cumulative effect of mutation at many genetic loci were used, such as an increase in the frequency of stillbirths, neonatal deaths, and/or deaths during the first nine months after birth; an increase in the frequency of congenital malformations; a decrease in weight; impaired physical development at nine months; and alteration in the sex ratio. Only with respect to sex ratio among children of irradiated parents was an effect observed. Paternal irradiation resulted in an apparent increase in the proportion of male births. Since the Y chromosome genetically speaking is considered relatively inert, radiation-induced mutations in this chromosome are unlikely to be as important as radiation damage in a paternal X chromosome. Lethal mutations in the X chromosome would cause death of potential daughters, giving a change in the direction of increased maleness in the sex ratio. The opposite outcome follows maternal irradiation, since a radiation-damaged X chromosome from the mother is not offset in male progeny. However, apart from mutations at the level of genes, the observed changes in the sex ratio might also receive a contributory effect from non-disjunction (the failure of a pair of chromosomes to segregate to respective daughter cells at telophase). (BBB)

45407 CHARACTERISTICS OF THE INDUCED EFFECT OF UV IRRADIATION AND ULTRASONICS ON A LYSOGENIC ACTINOMYCES FRADIAE STRAIN 8004 CULTURE. Soloveva, N. Ya.; Fadeeva, N. P.; Rautenshtein, Ya. I.; Elpiner, I. E. (Microbiology Inst., Academy of Sciences, USSR. Biophysics Inst., Academy of Sciences, USSR). Mikrobiologiya, 34: 442-9(1965). (In Russian).

In a series of experiments, lysogenic cultures of Actinomyces fradiae strain 8004 and control culture strains were exposed to uv-irradiation and ultrasonic vibration to compare effects on induced phage formation and liberation. Suspensions of A. fradiae spores and 5, 8, and 20 hr old mycelium were uv-irradiated by three BUV-15 lamps (wavelength 2537 angstroms, focal length 50 cm, 65.76 ergs/mm^2 sec) for periods up to 5 min. For ultrasonic vibration of A. fradiae cultures, a piezoquartz generator (700 kc/s, 15 watt/cm^2) was used for periods up to 45 min, with continuous cooling of cultures during vibration. Following uv irradiation and ultrasonic vibration, the cultures were transferred to columns and incubated at 27°. Culture samples were taken at regular intervals (up to 24 hrs) and centrifuged for 30 to 40 min at 2500 rpm to determine the number of liberated phages in the supernatant and induced phage formation by difference in experimental and control titers. Findings show that the number of phage particles spontaneously liberated by a lysogenic culture of A. fradiae 8004 depends on the maturity of the inoculated material. With spores and 5 to 8 hr old mycelium, an appreciable number of mature phage particles is liberated, approaching 10^8 to 10^9 units/ml in some cases. With 20 hr old mycelium, the number of spontaneously liberated phages is generally smaller. Thus, the formation of mature phage particles in lysogenic cultures is largely the result of young mycelium lysing. Both spores and 20 hr old mycelium of A. fradiae 8004 are affected by uv and ultrasonics, liberating 3 to 10 times as many phage particles as found in control cultures. (ATD)

45408 ENHANCED SUSCEPTIBILITY OF THYMECTOMIZED AND IRRADIATED MICE TO INFECTION WITH MYCOBACTERIUM LEPRAE. Rees, R. J. W. (National Inst. for Medical Research, London). Nature, 211: 657-8 (Aug. 6, 1966).

The human leprosy bacillus, Mycobacterium leprae, can be established in the mouse foot-pad, but multiplication of the bacilli is limited. One of the limiting factors seems to be an immunological one resulting from the infection. An attempt was made to enhance the infection by prior exposure of mice to thymectomy plus total body radiation because of the known depressive effect of these combined procedures on antibody production. Twelve mice were thymectomized and X irradiated, and twelve were kept as untreated controls. Four weeks later a foot-pad of each mouse was inoculated with the leprosy bacilli. One mouse from each group was killed at the fifth month, and thereafter at 2-monthly intervals, and the foot-pads were homogenized to determine the total yield of bacilli. The yields were much greater in the thymectomized-irradiated mice than in controls. There was no evidence of systemic spread of infection as no bacilli were seen in stained smears from livers and spleens. These experiments indicate that one factor limiting multiplication of Mycobacterium leprae is the development of immunity during the course of infection. (H.L.W.)

45409 RADIATION RECOVERY RESPONSE OF MAMMALIAN TUMOR CELLS IN VIVO. Belli, James A.; Bonte, Frederick J.; Rose, Mary Sue (Univ. of Texas, Dallas). Nature, 211: 662-3(Aug. 6, 1966).

Experiments were undertaken to study radiation recovery response of P-388 tumor as a function of tumor age at the time of the conditioning dose. Animals bearing one or six day tumors were irradiated with whole-body doses of 500 R and 1500 R respectively. At intervals of time up to 14 hours following this conditioning dose, a second, equal dose was delivered to the same animals. Immediately after the second dose, cells were removed from the abdomen and assayed for reproductive viability. Initial rapid repair was evident in tumors of either age. However, the rate of repair was slower in 6-day hypoxic tumors. Initial repair appeared to reach a maximum by 6 hours following the conditioning dose in both tumors. A subsequent minimum was seen at 9 hours which rose to a second maximum by 12 hours in 1-day tumors. In the hypoxic condition, however, this minimum appeared to persist through 13 hours. It has been demonstrated that malignant mam-

malian cells are capable of repairing sublethal radiation damage whether in the oxygenated or hypoxic state. The kinetics of the recovery response differ in that hypoxic tumor cells appear to repair sublethal damage at a slower rate than aerobic cells. (H.L.W.)

45410 MEDICAL AND BIOLOGICAL EFFECTS OF IONIZING RADIATIONS. Randolph, M. L. Nucl. Safety, 7: 476-81(Summer 1966).

Some aspects of current studies on biological effects of ionizing radiations are reviewed to give a sense of the experimental bases for appraisals of the hazards of exposure to radiations. Subjects treated briefly through references to recent literature include delayed somatic effects, biological dosimeter, reduction of fertility, relative effects of different types of radiation, dose rate and fractionation, and effects of small doses. Authoritative reviews and references to biologically useful applications of ionizing radiations are cited. Physical aspects, historical background, and additional active fields of radiobiology are indicated. (auth)

45411 ACCELERATION OF AGEING BY IONIZING RADIATION. Maqsood, M. (CENTO Inst. of Nuclear Science, Teheran). Pakistan J. Health, 11: 195-9(Jan. 1962).

Data are reviewed that indicate that ionizing radiations shorten life span in experimental animals. Irradiated animals surviving the period of acute radiation illness may recover clinically or show little or no clinical illness depending upon the dose, and may live for a long time, but die prematurely. Some quantitative relations between life shortening and radiation dose are derived mathematically from the experimental data, for various types of ionizing radiations and radioactive materials and species of animals. The experimental evidence indicates that radiation injury is partly reversible and partly irreversible, and that the irreversible component ultimately shortens life span. Irreversible injury is measurable, after an interval of apparent maximal recovery, as a reduction in the size of the acute lethal dose of radiation. In man, mortality figures indicate life shortening in American radiologists who may have received doses in the course of their occupation ranging from very slight to about 1000 R. The conclusion from all studies of animal populations exposed to radiation in the range of 100 to 1200 R of whole-body exposure is that these doses shorten life span. It is estimated that the average human life-span loss at a dose of 100 R may be about 1⅓ years, furthermore that 1 R of whole-body irradiation is equal to becoming 5 days older. Shortening of the life span may result from exposure to radiation not only as a consequence of damage to a specific tissue, as seen in the development of skin cancer and leukemia, but also as a result of such general factors as lowered immunity, damage to connective tissue, or premature aging. The fundamental mechanisms of acceleration of aging by ionizing radiation are no better known than the fundamental mechanism of aging itself. However, the acceleration of generalized arteriocapillary fibrosis by irradiation seems to be an important common denominator or mechanism underlying the accelerated aging changes observed in the parenchyma of many of the organs. Some specific radiation-induced degenerative diseases are nephrosclerosis, aplasia, and fibrosis of the bone marrow, dermatitis, osteitis, sterility, and cataract. The life-shortening action of radiation is attributable to these particular diseases in relatively few instances; and it must, therefore, depend primarily on other deleterious effects, as yet unknown. (BBB)

45412 ROLE OF THE OLFACTORY BULBS IN THE DETECTION OF IONIZING RADIATION BY THE RAT. Dinc, Hattice Iffet; Smith, James C. (Florida State Univ., Tallahassee). Contracts AT-(40-1)-2903; -2690. Physiol. Behav., 1: 139-44(1966).

The sensitivity to x rays in the albino rat was studied following destruction of the olfactory bulbs. The two procedures of conditioning an aversion to saccharin solution with x rays as the unconditioned stimulus and conditioned bar press suppression with x rays as the warning stimulus were both used in testing the sensitivity to the ionizing radiation. The profound aversion to saccharin flavored water, obtained in rats after a single pairing of x rays with the saccharin solution, was found to be diminished in animals that had olfactory ablations. The conditioning of sham operated animals and those with frontal lesions resulted in the usual significant saccharin aversion. The immediate detection of x rays was profoundly affected by removal of the olfactory bulbs. Animals that had previously been conditioned to suppress a bar-pressing response in the presence of x rays failed to show this suppression after complete removal of the olfactory bulbs. When ablation was incomplete, with removal of tissue from the frontal lobes, or with sham operations, the animals continued to show the suppression effect at the onset of x-ray exposure. (auth)

45413 VESTIBULAR ANALYSER AS A CRITICAL ORGAN FOR THE EVALUATION OF RADIATION HAZARDS IN SPACE FLIGHTS. THE EFFECT OF IONIZING RADIATION IN A WIDE DOSE RANGE ON PHYSIOLOGICAL FUNCTIONS OF CUPULA APPARATUS. Grigor'ev, Yu. G. (Inst. of Medico-Biological Problems, Moscow). Physiol. Bohemoslov., 15: 372-7(1966). (In Russian).

Using adequate techniques permitting quantitative assessment of the functional state of the vestibular analyzer, some results were obtained characterizing the functional disturbances of semicircular canals in rabbits and dogs exposed to 50 to 10,000 R of x-irradiation. By means of ionizing radiation (radioactive applicator method) isolated elimination of otolith function was obtained. The results indicate that the vestibular analyzer should be regarded as a critical organ for estimation of space radiation hazards. (auth)

45414 GROWTH AND REPRODUCTIVE POTENTIAL OF THE DOMESTIC FOWL AFTER EMBRYONIC X-RADIATION. Muller, H. D.; Moreng, R. E. (Colorado State Univ., Fort Collins). Poultry Sci., 45: 336-45(Mar. 1966).

White Leghorn eggs were x irradiated to doses of 300 to 1100 R at various stages of development, and growth and reproductive ability of the irradiated birds were followed. Sensitivity of the embryo to x radiation fluctuated during ontogenic development. Since latent injury progressively exerted its influence, the quantity of radiation required to elicit a mean lethal dose response from the avian embryo decreased with postradiation time. Posthatching body weights of survivors were lower than those of nonirradiated controls, and weight reduction remained constant for the first 16 weeks of life. Depression of growth rate was partially dependent upon embryo age at exposure. Female survivors of embryonic irradiation exhibited depressed ovulation rates following sexual maturity, in relation to both radiation doses and embryo age at exposure. Male survivors failed to exhibit any impairment in capability to fertilize the ova of normal females or subsequently to produce viable progeny. Evaluations of testes weights, seminiferous tubule development and sperm quality of survivor males did not disclose any significant deviations from normal values. Embryonic exposure to radiation at levels which produced a 50% mortality resulted in depression of both growth and ovulation rates in the survivor females and in the growth rates but not the reproductive capabilities of survivor males. Growth and reproductive potential were depressed, but only a few cases demonstrated substantial impairment of either growth or reproductive ability. The observed growth and reproductive responses demonstrated that both dependent and independent components are concerned in latent responses to embryonic radiation exposure. (BBB)

45415 COMPOSITION OF YEAST STEROLS. Gal'tsova, R. D.; Novichkova, A. T.; Ionicheva, G. A. Prikl. Biokhim. Mikrobiol., 1: 294-8(1965). (In Russian).

Cells of Saccharomyces cerevisiae were irradiated with x rays (60 kR) and after 48 hr suspensions of both the irradiated and nonirradiated yeasts in water or glucose solution (2, 4, 8, and 10%) were treated with 5% NaOH for 5 hr and an ether extract was evaporated to dryness and redissolved in dichloroethane. After esterification with 0.5M

oxalic acid, 5 ester fractions were obtained, and these were hydrolyzed to yield free sterols. Thin-layer chromatography showed that ergosterol constituted 60% of the total sterol content. Irradiation increased the total sterol content by 115% and ergosterol by 136%, but did not alter the pattern of the 6 sterols present. Ergosterol content also increased significantly when the irradiated cells were suspended in 4 and 8% glucose. (C.H.)

45416 EFFECT OF GAMMA IRRADIATION ON THE STORAGE OF SUNFLOWER SEEDS. Koshlakova, K. G.; Romanova, L. V.; Falk, E. Yu.; Chernomorskii, S. A. (All-Union Research Inst. of Fats, USSR). Prikl. Biokhim. Mikrobiol., No. 4, 471-3(July-Aug. 1965). (In Russian).

The results of the experiments reported showed that 300,000 R was the minimum lethal dose for molds. However, despite the sharp decrease in quantity of molds and bacteria on the seeds after exposure, the number of microorganisms increased markedly on moist seeds stored under nonsterile conditions, although it was less than in the control samples. Seed respiration immediately after exposure was more intense than in the control. With an increase in the duration of storage and a moisture content of 15 to 20%, the intensity of respiration and acid number of oil in the seeds increased along with the number of microorganisms on the seeds. In these respects the irradiated seeds were not appreciably superior to nonirradiated seeds. The content of peroxide compounds also rose after irradiation. Exposure of sunflower seeds moistened about 13% to 300,000 and 1,000,000 R increased the peroxide number 5 to 7 fold. After 3 days of storage, respiration of the irradiated seeds was much less intense than that of the control. However, after 6 days of storage, respiration intensity was the same in both the experimental and the control seeds. This resulted in an increase in the number of bacteria and molds on the irradiated seeds. It is concluded that exposure of moist seeds to gamma rays does not prevent them from spoiling if kept under nonsterile conditions. Moreover, ionizing radiation impairs the quality of the oil obtained from the treated seeds. (ATD)

45417 LATE SOMATIC EFFECTS OF COMBINED IRRADIATIONS OF FAST NEUTRONS AND GAMMA-RAYS IN THE MOUSE. Takizawa, Shoichi; Ito, Akihiro; Wake, Minoru; Yokoro, Kenjiro; Hirose, Fumio. Proc. Res. Inst. Nucl. Med. Biol., No. 7, 54-64(1966). (In Japanese).

Female ddN mice ages of 6 to 8 weeks were irradiated with fast neutrons and γ rays in doses ranging from 255 to 340 rads and from 419 to 510 rads, respectively. The animals were observed for thirteen months after irradiation in order to study the delayed effects. The data obtained were compared with those of γ-irradiated and nonirradiated controls. Six cases of lymphoma developed among the 36 mice that had received the combined radiation, while nine cases out of twenty-five γ-irradiated and one case out of ten nonirradiated mice developed lymphoma. Grossly, the lymphomas were divided into thymic and nonthymic types. The former predominated among the combined group and the latter among the γ-irradiated group. Six cases of ovarian tumors were observed among the irradiated mice, five cases of which belonged to the combined group. They were, histologically: granulosa cell tumors, adenoma, luteomas, and hematoma. The mice bearing a granulosa cell tumor were somewhat stimulated by the estrogenic hormone produced by the tumor cells. A few cases of the mammary adenocarcinoma and pulmonary adenoma were seen in both irradiated groups. Nephrosclerosis, pulmonary edema, amyloidosis-like lesion and splenic hemosiderosis developed almost exclusively among the combined group. The intensity and the extent of these lesions were variable. (auth)

45418 CASE OF CHRONIC LYMPHOCYTIC LEUKEMIA WITH MARKED LYMPHOCYTOSIS FOUND IN AN ATOMIC BOMB SURVIVOR. Kamada, Nanao; Niimi, Masanobu; Oomae, Kiyokazu; Ito, Akihiro; Okada, Kosuke; Tsuchimoto, Taiso; Takizawa, Shoichi; Yokoro, Kenjiro. Proc. Res. Inst. Nucl. Med. Biol., No. 7, 81-9(1966). (In Japanese).

The progression of chronic lymphocytic leukemia in a 69-year-old male survivor of the atomic explosion in Hiroshima is described. Pathological changes in the blood and lymph system are considered. Necropsy showed moderate hepato-splenomegaly and enlargement of the iliac, paratracheal, and right cubital lymph nodes. The most active proliferation of the leukemic cells was microscopically observed in the spleen and the ileocecal lymph nodes. Leukemic infiltration were found in the liver, kidneys, and bone marrow. The incidence of chronic lymphatic leukemia in Asia, life span of leukemic lymphocytes, and the relation between leukemogenesis and exposure to the atomic bomb are discussed. (H.G.D.)

45419 DEPARTMENT OF PATHOLOGY AND CANCER RESEARCH. Watanabe, Susumu; Hirose, Fumio; Yokoro, Kenjiro; Takizawa, Shoichi; Wake, Minoru; Ito, Akihiro. Proc. Res. Inst. Nucl. Med. Biol., No. 7, 129-35 (1966).

Progress is reported on: statistical studies of the incidence of leukemia among Hiroshima survivors; the biological effects of some radiations, especially on the acute and chronic injuries with 14.1 Mev fast neutron irradiation; hematopoietic tissue transplantation, especially on the protective effect of bone marrow transplantation on radiation injuries; thymus function, especially on its immunological competency; the experimental induction of leukemia by external and internal irradiation or by leukemia virus; and radiation tumorigenesis in mice and rats. (H.G.D.)

45420 DEPARTMENT OF INTERNAL MEDICINE. Uchino, Haruto; Ozono, Noboru; Tanaka, Nobuo; (and others). Proc. Res. Inst. Nucl. Med. Biol., No. 7, 154-62(1966).

Clinical and experimental studies are reported on delayed effects in the atomic bomb survivors, with a special reference to the studies on pathological physiology and treatment of the hematological disorders including leukemias, the studies on the mechanisms of the development of the somatic injuries due to the ionizing radiation as well as the radiomimetic agents and its treatment, and the studies on the mechanism of the antimetabolite as the antileukemic as well as the anticancer agents. (auth)

45421 ON THE DIFFERENCE BETWEEN THE LETHAL EFFECTS OF ^{3}H AND ^{32}P IN BACTERIA. Koch, Arthur L. (Univ. of Florida, Gainesville). Radiat. Res., 29: 18-32 (Sept. 1966).

The lethal effects of incorporated radioisotopes into bacterial populations labeled during logarithmic growth are analyzed. A model is presented which is in accord with experimental observation, in which it is assumed that the genetic material and cell constituents are synthesized almost constantly and exponentially throughout the cell division cycle. Together with an assumption that cell division ensues when the cell reaches a critical size, it is shown that the DNA per cell is distributed according to the same inverse-square distribution law that applies to cell size. The properties of this distribution have been given previously. Finally, the analysis takes into account the fact that nuclear body separation is midway between cell divisions. Two cases are treated. A hit any place in the genome inactivates that genome; solutions are found which contain integrals that can be numerically evaluated in terms of tabulated functions. The calculated curves have lower extrapolation numbers than the population average number of nuclear bodies. This model adequately accounts for results with ^{3}H. A hit in only one of the partially replicated regions of a chromosome does not render inviable the genome resulting from the further replication and separation of the other double strand; markedly higher extrapolation numbers are calculated. This model accounts for the multihit kinetics observed for ^{32}P suicide, and this is compatible with the reported extrapolation numbers which are larger than our cytological observation of the average number of nuclei per cell. (auth)

45422 EFFECT OF IONIZING RADIATION ON STARCH BREAKDOWN IN BARLEY ENDOSPERM. Faust, Miklos;

Massey, L. M. Jr. (Cornell Univ., Geneva, N. Y.). Radiat. Res., 29: 33-8(Sept. 1966).

In barley endosperms, besides the direct physicochemical effect of γ radiation on starch molecules, a biochemical lesion occurs in the synthesis of the starch-hydrolyzing enzyme α-amylase. As a result, there is less starch hydrolyzed in irradiated endosperms when they are exposed to conditions in which normal enzymological hydrolysis would ensue. (auth)

45423 A ROENTGENOGRAPHIC STUDY OF TERMINAL PATHOLOGICAL CHANGES IN SKELETONS OF ^{90}Sr TREATED RATS. Hopkins, B. J.; Casarett, G. W.; Baxter, R. C.; Tuttle, L. W. (Univ. of Rochester, N. Y.). Radiat. Res., 29: 39-49(Sept. 1966).

Postmortem roentgenographs of three groups of rats given ^{90}Sr by various routes of administration were examined. Roentgenographic bone changes were seen in 33.3% of 75 rats that received fractionated oral administration of 789 μC at 124 days of age. One or more osteogenic sarcomas were present in 21.3% of the individual animals, and slight changes of bone density occurred in another 12.0% of the rats. Bone changes of various degrees were seen in all of 33 rats that received fractionated injection of 75 μC intravenously at 50 days of age. Bone cancers and changes of bone density were present in 75.8% and 24.2% of the animals, respectively. Likewise, roentgenographic changes were seen in all of 36 rats that received fractionated injection of 82 μC intraperitoneally. Bone cancers and changes of bone density were present in 47.1% and 52.9% of the animals, respectively. The degrees of changes of bone density, the incidence of bone cancers, and the rate of increase of incidence of bone cancer with increasing time after ^{90}Sr treatment were greater in the injected groups than in the orally dosed group. There was also a greater degree of shortening of the mean expected life span in the former groups, 65%, as compared with 36% in the latter group. The majority of bone cancers developed in the long bones in all of the three experimental groups, but the average number of bone cancers per cancer-bearing rat was highest in the D-IV group, 1.48, followed by 1.25 in the D-IP group and 1.125 in the C-Oral group. (auth)

45424 THE EFFECT OF ^{89}Sr ON THE STEM CELL COMPARTMENT OF THE SPLEEN. Fried, W.; Gurney, C. W.; Swatek, M. (Argonne Cancer Research Hospital, Chicago. Univ. of Chicago). Radiat. Res., 29: 50-6 (Sept. 1966).

Evidence is presented indicating that ^{89}Sr-induced radiation damage to the bone marrow of mice is followed by a marked proliferation of stem cells in the spleen. These data suggest to us that a humoral mechanism may be involved in regulation of numbers of cells in the stem cell compartment. (auth)

45425 EFFECT OF CONTINUOUS GAMMA IRRADIATION OF THE GENERATION CYCLE OF THE DUODENAL CRYPT CELLS OF THE MOUSE AND RAT. Lesher, S. (Argonne National Lab., Ill.); Lamerton, L. F.; Sacher, G. A.; Fry, R. J. M.; Steel, G. Gordon; Roylance, P. J. Radiat. Res., 29: 57-70(Sept. 1966).

The mitotic cycle of the rapidly dividing duodenal crypt cells of rats and mice was studied by autoradiography with tritiated thymidine after exposure to continuous γ-irradiation for 12, 35, and 105 days for rats and 12 and 35 days for mice. It was found that a well-defined sequence of events takes place when animals are exposed to continuous irradiation. After a 1-day exposure, the movement of cells into or through mitosis is slowed and possibly partially blocked in G_2. By 12 days, the shape of the curve is normal, but the generation cycle is approximately 20% shorter. The reduction in GT duration is temporary, and the GT is approaching control values by 35 days in the mouse and by 105 days in the rat. This reduction in the GT appears to be a compensatory reaction which the rodent is able to make to assist in the production of a sufficient number of cells that replace those damaged by irradiation and hence to maintain the mucosal cover of the villi. It was found that the cell damage in the crypts of the rat was different from that in the mice. In the rat, cell damage was evident in the upper part of some crypts. (auth)

45426 RECOVERY AND REPOPULATION IN MOUSE SKIN AFTER IRRADIATION WITH CYCLOTRON NEUTRONS AS COMPARED WITH 250-kv X RAYS OR 15-Mev ELECTRONS. Denekamp, J. (Postgraduate Medical School, London); Fowler, J. F.; Kragt, K.; Parnell, C. J.; Field, S. B. Radiat. Res., 29: 71-84(Sept. 1966).

Skin reactions on the legs of mice irradiated by cyclotron neutrons, 15-Mev electrons, or 250-kv x rays have been compared. The reactions in groups of 6 mice each exposed to a given dose were scored on an arbitrary scale, and the average daily reaction was plotted against time. For equal maximum reactions, no difference was found in the rates of increase and subsequent decrease of skin reaction after neutron, electron, or x-irradiation. This finding is interpreted as showing that rates of cellular repopulation are not significantly different after the high-LET or low-LET irradiation. The magnitude of the short-term recovery in mouse skin, as measured by split-dose irradiations given 24 hours apart, was found after fast neutrons to be one-half to two-thirds as great as that after x rays or electrons, when allowance was made for the single-dose RBE. (auth)

45427 GENETIC TRANSMISSION OF RADIATION-INDUCED PHYSIOLOGICAL DEPRESSION IN THE DOMESTIC FOWL. Muller, Harry D.; Moreng, Robert E. (Colorado Agricultural Experiment Station, Fort Collins). Radiat. Res., 29: 85-99(Sept. 1966).

Progeny of x-irradiated females and control males demonstrated minor deviations from normal body weight. However, female X_1 progeny of irradiated males exhibited significant deviations from control measurements. Body weight depression apparently was transmitted in a recessive-sex-linked manner and was dependent on both age at exposure and irradiation dosage received by the male parent. Female X_1 progeny of irradiated females and control males exhibited significantly depressed reproductive potentials which correlated with irradiation dosage administered to the female parents. Irradiated X_1 progeny of irradiated females demonstrated body weights which differed significantly from control values. The magnitude of growth depression was parallel to that demonstrated by the X_0 females. A parental history of irradiation survival apparently imparts no additional radioresistance to the X_1 generation. (auth)

45428 EFFECT OF WHOLE-BODY IRRADIATION ON THE PREOPTICO-HYPOPHYSEAL NEUROSECRETORY SYSTEM AND THE HYPOPHYSIS OF THE GOLDFISH CARASSIUS AURATUS L. Sathyanesan, A. G.; Chavin, Walter (Wayne State Univ., Detroit). Radiat. Res., 29: 100-13(Sept. 1966).

The preoptico-hypophyseal neurosecretory system and the hypophysis of goldfish showed wide variations in response to a given specific dose of cerium-137 irradiation. The neurosecretory cells did not show prominent histopathological changes within 5 days after irradiation, irrespective of the dose. Degeneration or degranulation of the large cells of the pars magnocellularis resulting in a chromophobic condition appeared 11 to 21 days postirradiation at all but the highest dose levels. At 70 kR, such changes appeared at 6 days. Some axonal injury or degeneration was also present. Different stages of recovery were present 28 to 42 days postirradiation. Of the 189 irradiated fishes studied histologically, 10 showed marked morphological hypophyseal changes. The changes included hypophyseal distortion and heavy infiltration of connective tissue which even completely separated portions of the pituitary. In spite of these changes, the basic cell types could be readily identified. In other fish, the components of the pituitary could not be identified tinctorially, owing to complete degranulation. Often the acidophils of the rostral pars distalis were more highly chromatic than those of the caudal pars distalis. In some irradiated fishes with pituitary abnormalities, the neurosecretory cells were normal. Conversely, in other fish with abnormal neuro-

secretory cells the pituitary appeared normal. Thus, it is possible that the two systems may not be completely related. (auth)

45429 COMPARATIVE REPOPULATION RECOVERY OF CIRCULATING ERYTHROCYTES FOLLOWING GRADED SECOND GAMMA-RAY EXPOSURES IN MICE. Spalding, J. F. (Los Alamos Scientific Lab., N. Mex.). Radiat. Res., 29: 114-20(Sept. 1966). (LA-DC-7579).

Mice were exposed to 200, 400, 600, or 800 rads of γ rays (6 rads/min), and the injury and recovery pattern of the bone marrow was followed by RBC determinations for 90 days postexposure. Second exposures were given following the 90-day recovery period; they were of the same magnitude as first exposures, but the dose groups were reversed so that each group received a total of 1000 rads. Comparative recovery patterns were done following second exposures to determine the extent of irreparable bone marrow injury from first exposures. Repopulation recovery of circulating erythrocytes failed to reveal an irreparable bone marrow lesion. Mice with second exposures were able to recover with the same resilience as from a single exposure. (auth)

45430 OXIDATIVE PHOSPHORYLATION IN LIVER MITOCHONDRIA FROM X-IRRADIATED RATS. Thomson, John F.; Nance, Sharron L.; Bordner, Linda F. (Argonne National Lab., Ill.). Radiat. Res., 29: 121-30(Sept. 1966).

A study of the phosphorylative capacity of mitochondria prepared from livers of rats exposed 4 hours previously to 1000 R of total-body x-irradiation has shown no effects of exposure on oxygen consumption or phosphate esterification under a variety of conditions. Variations in experimental procedure involved the use of different ages, sexes, and strains of rats, three different substrates, and four mitochondrial preparations with varying degrees of homogeneity. (auth)

45431 RECOVERY FROM RADIATION INJURY IN DOGS AS EVALUATED BY THE SPLIT-DOSE TECHNIQUE. Ainsworth, E. J.; Leong, G. F. (Naval Radiological Defense Lab., San Francisco). Radiat. Res., 29: 131-42 (Sept. 1966).

The split-dose technique was used to evaluate recovery from radiation injury in dogs given an initial conditioning exposure to 217 R x radiation, which is about two-thirds of the LD_{50}. Based on LD_{50}'s determined at 1, 3, 7, 14, and 20 days after the conditioning exposure, recovery was rapid, with 50% recovery occurring by about 3 days. Because of relatively large 95% confidence intervals, the recovery rate per se is difficult to establish. An exponential curve with a recovery half-time of 3.1 days may be an acceptable fit to the data. However, between 3 and 20 days the animals' radiosensitivity appeared to change approximately linearly at a rate of ~8.5 R/day. At 20 days, ~40 R of radioresistance was detected, but this was not statistically significant. The numbers of circulating leukocytes were followed for several months after exposure to 150 or 217 R. The leukocyte counts returned to only 70 to 80% of the preirradiation values by ~4 months. The data are discussed in terms of the proposed correlation between recovery from radiation injury and basal metabolic rate or changes in the number of circulating leukocytes. (auth)

45432 STUDIES ON THE MUTATION INDUCTION BY THE INTERNAL RADIATION OF β EMITTING RADIOISOTOPES. I. ON THE METHOD OF SEED TREATMENT. Onozawa, Yoshiro. Radioisotopes (Tokyo), 15: 187-94(1966). (In Japanese).

The influences of different conditions at seed treatment (i.e., soaking time, temperature, physiological condition of seed, etc.) on radioisotope (RI) absorption were studied, and biological effects were investigated. It was observed that RI absorption by seed took place actively after root protrusion. In dormant seed treatment, thus, there was much variation in amount of absorbed RI among seeds, depending on the lack of uniformity of germination. The amount of RI absorption was not so changed by the different soaking temperatures unless it was too low for germination, but changed by the different volumes of treated RI solution(ml/seed), and the kind of seed bed used for soaking. It was suggested that the treatment of pre-soaked and germinated seed was more efficient for shortening of soaking time and keeping uniformity of RI absorption among treated seeds. In the case of ^{32}P treatment for germinated barley seed, however, the physiological damage in treated generation and mutation frequency in next generation were slightly lower compared with that of dry seed treatment. (auth)

45433 ON 103 CASES OF THYMUS HYPERTROPHY AFTER ROENTGEN IRRADIATION IN CHILDHOOD AND FOLLOWED 6 TO 30 YEARS AFTER TREATMENT. Massenti, S. (Univ., Pisa, Italy). Radiol. Med., 48: 261-79 (Mar. 1962). (In Italian).

Follow-up studies were conducted on 152 subjects who had received x-ray treatment for enlarged thymus in childhood. Complete information could only be obtained on 103 cases. Evidence was sought for neoplastic disease, especially thyroid cancer, which has been reported to occur in relatively high frequency after thymus irradiation in childhood. The average postirradiation period in these subjects was 15 yr 7 months. The technique of treatment consisted of 50 R daily doses of 170 kv x rays, to a total dose of as high as 1200 R, usually over an 8×8 cm field. No cases of cancer or leukemia were found on follow-up survey of these patients. There was one case of mammary gland fibroma. A critical examination of the literature was made, and it is concluded from this review as well as from the author's study that with proper technique and dosage, thymus irradiation in childhood does not appear to be hazardous. (77 references.) (BBB)

45434 TISSUE CHANGES IN LIVER, SPLEEN, AND KIDNEYS FROM THE ACTION OF IONIZING RADIATION. Morgenroth, K.; Themann, H. (Univ., Muenster, Ger.). Radiologe, 6: 86-94(Mar. 1966). (In German).

Livers and spleens of mice given whole-body x irradiation of 300, 3000, and 9000 R, and kidneys of guinea pigs given 3000 R in single or fractionated doses were studied with the electron microscope. Depending on the time after irradiation, vacuolar degeneration of the mitochondria and vesicular changes in the endoplasmic reticulum, frequently involving necrosis, were observed. The changes in the cell nuclei were evidenced in the form of karyoplasma clumping and expansion of the intermembranous spaces. It could be ascertained that the changes which appeared in the organs studied were not specific for the radiation injury received. The changes observed occurred in phases, and the degree of injury of the cytoplasm was related to the post-irradiation time. Efforts were made to correlate the morphological findings with biochemical changes reported in the literature. A comparison of the irradiation series in the kidney after single and fractionated irradiation showed that the kidney reacted considerably more intensively to fractionated irradiation than it did to irradiation administered in a single dose. (BBB)

45435 CAPILLARY MICROSCOPIC STUDIES IN INDIVIDUALS WORKING IN A SPHERE OF IONIZING RADIATION. Vaskov, D. (Scientific Research Inst. of Radiology and Radiation Hygiene, Sofia). Rentgenol. Radiol., 4: No. 1, 54-8(1965). (In Bulgarian).

Changes in the picture of the capillary microscopy in the skin fold of the nails of the hands of persons working in a sphere of ionizing radiation are reported. The frequency and degree of these alterations increase with increase of the working period in an ionizing environment in roentgenologists and radiologists whose hands are, for the most part, exposed. The single or combined alterations described are nonspecific for radiation injury. They can be observed in other diseases, and more rarely healthy individuals. (JPRS)

45436 ANATOMO-PATHOLOGICAL REACTIONS OF THE KIDNEY AFTER MASSIVE IRRADIATION. Rebaudi, Arturo Sergio. Rev. Argent. Urol., 33: 466-79(Oct.-Dec. 1964). (In Spanish).

The effect of renal irradiation was studied in rats. Cobalt-60 γ radiation was delivered to a 2×4 cm field in the lumbar region. The kidneys were given a total dose of 2137 R in fractions of 202 R over a three-week period. Histological studies were performed 12 hr, 30 days, and 60 days after the last irradiation. In the first (12-hr) group, edema and congestion of the kidney were seen, and changes (dilatation and desquamation) in the Henle loops and collecting tubules. The glomeruli were normal. In the second (30-day) group, the edema in the cortex had disappeared, but the glomeruli showed congested and dilated capillaries, and Bowman's capsule was adherent to the capillaries. The proximal convoluted tubules were normal but the distal ones were dilated, their epithelial cells vacuolated, and the nuclei hyperchromic. The loops of Henle and collecting tubules were dilated and filled with desquamated cellular debris. The third (60-day) group showed bloodless and, in some cases, contracted glomeruli. Some proximal convoluted tubules were dilated and their cells contained pyknotic nuclei. Some Henle loops were collapsed. Regenerative changes were evident in collecting tubules. The renal capsule had undergone fibrosis. The results demonstrate the relatively greater radiosensitivity of the tubular epithelial cells as contrasted to the glomerular and interstitial cells. (BBB)

45437 ON THE IN VITRO PROLIFERATION OF TISSUE TAKEN FROM THE RHIZOMES OF THE JERUSALEM ARTICHOKE HAVING BEEN SUBJECTED TO THE ACTION OF X RAYS. **Jonard, Robert. Rev. Cytol. Biol. Veg., 27: 293-300(1964). (In French).**

Irradiation of the rhizomes of Jerusalem artichokes was found to produce latent changes in the cells which were expressed when portions of the irradiated tissue were grown in culture. The rhizomes in the resting state were exposed to 250-kv x rays at a dose rate of 100 R/min to give doses of 500 to 3000 R. Explants were made in a medium containing 10^{-6} parts of indoleacetic acid. The increase in weight of the cultured material after 40 days and the final weight of the dried material are given, respectively for various doses: 0 R, 100% (control value was set at 100%), 13% (as percentage dry weight of total wet weight); 500 R, 108%, 13.4%; 2000 R, 59%, 14.8%; 2500 R, 40%, 17.9%; and 3000 R, 24%, 18.5%. Thus, doses of 1000 R and higher significantly inhibited proliferation of the rhizome tissue. The 3000-R dose almost completely inhibited growth; only a thin growth zone was seen, no phloem was formed, and only nuclear division without true cellular proliferation was seen. Various anomalies developed in plants from the irradiated (1000 to 2000 R) rhizomes are described. (BBB)

45438 ACTION OF X RAYS ON ORGANOGENESIS PHENOMENA IN TISSUE CULTURES IN VITRO. **Narayanaswamy, Sankar. Rev. Cytol. Biol. Veg., 27: 301-5 (1964). (In French).**

Fragments of the tubers of the Jerusalem artichoke were used to study the effect of x rays on the formation of roots after various periods of tissue culture. Fragments, 8×12 mm and weighing 800 to 1000 mg, of tissue from the Violet de Rennes variety were cultured in Heller mineral solution and explants were irradiated 2 to 14 days after being cultured by 250-kv x rays to doses of 500, 1000, or 2000 R. Induction of root formation was progressively inhibited by increasing doses. The 2000-R dose caused complete inhibition in 2- to 8-day explants. Sensitivity to x rays appeared on the 4th day and increased to a max on the 8th day. At this time inhibition was complete with all three x-ray doses. The 12-day-old cultures were less radiosensitive. Other experiments were done with graded doses of x rays, from 50 to 800 R, given on the day (8th) of max sensitivity. This showed that the min effective dose for complete inhibition of root formation is 400 R, but some inhibition was evident with as little as 50 R. (BBB)

45439 INFLUENCE OF PHYSICAL CONSTITUTION ON THE ABSORPTION OF ELECTROMAGNETIC WAVES. **Musil, J. Slaboproudy Obz., 26: 391-7(July 1965).**

The effects of high or ultrahigh frequency of electromagnetic radiation as a function of various physical parameters of the human body are evaluated. Using the Smith impedance diagram, a qualitative method was developed for models consisting of homogeneous layers of various thicknesses and having the properties of skin, body fat, and muscle; the influence of clothing was also taken into account. The amount of energy absorbed was found to vary greatly, depending on frequency and layer thickness. Absorption was highest (about 90% of the theoretical maximum) in the region of 1000 mC/s, whereas at 3000 mC/s the proportion was only 20%. The greatest differences in absorption, involving variations of up to 65%, were also observed in the 3000 mC/s frequency band. (Occup. Safety Health Abstr.)

45440 PATHOGENESIS OF THE DELAYED RADIATION INJURY TO SPINAL CORD. **Zeman, Wolfgang (Indiana Univ., Indianapolis. Brookhaven National Lab., Upton, N. Y.). Strahlentherapie, Sonderbaende, 62: 68-76(1966). (In German).**

The pathogenesis of the delayed radiation necrosis is preponderately determined by the somatic mutations to the interstitial cells caused during the irradiation. These mutations, which lead individually to very different functional perturbations of the cells, decrease in their totality the metabolic function capacity and adaptability of the irradiated tissue. This metabolic insufficiency is progressive since the radioinduced increased mitotic activity causes a continuous aggravation of the damage. The interval before the delayed necrosis develops, the latency period, is inversely proportional to the biological effective dose. Therefore there is the possibility of detecting a modification of the radiation effect by a change of the latency period. It was shown that not only the biological ratios appearing during radiation determine the radiation efficiency, but that a series of pathological processes, that arise during the post-irradiation period, shorten the latency period. The significance of these data for the explanation of individual radiosensitivity was discussed. (tr-auth)

45441 RADIATION TOLERANCE OF THE SPINAL CORD. **Breit, Alfred (Staedtische Krankenhauses, Passau, Ger.). Strahlentherapie, Sonderbaende, 62: 77-83(1966). (In German).**

After an introductory review of known cervical spinal cord damage, the clinical therapeutic value of tolerance curves for the spinal cord in the form of fractionation diagrams according to the basic concept of Strandqvist was discussed. The problematics of a single copy of the Strandqvist lines for the skin was indicated. The clear dependence and frequency of transverse paralysis on the dose, the time dose distribution, and the survival time (observation time) was shown by a large series of animals that were irradiated by a clinical-therapeutic usage of a corresponding fractionation scheme. A double log diagram in which the mean effective dose (ED 50) is plotted as a function of fractionation, observation time, and type of animal, was given as a tolerance table. A comparison of these experiments with observations on men shows that the spinal cord tolerance, especially in long recovery periods, is lower than earlier assumed. (tr-auth)

45442 ULTRASTRUCTURAL RADIOREACTION ON GUINEA PIG BRAINS. **Franke, Herbert; Lierse, Werner (Univ., Hamburg). Strahlentherapie, Sonderbaende, 62: 138-42(1966). (In German).**

Ultrastructural and histochemical findings show a high reaction capacity of the wall elements of capillaries in the low and high dose region. In the mean and high dose region ganglia and neuroglia cells show enzyme damage to glycogen mucopolysaccharides. (tr-auth)

45443 CONTINUOUS IRRADIATION OF WHITE MICE WITH X RAYS (2.5 r/DAY OR 1.2 r/DAY). **Rajewsky, Boris; Heuss, Kurt (Max-Planck-Institut fuer Biophysik, Frankfurt am Main). Strahlentherapie, Sonderbaende, 62: 176-86(1966). (In German).**

White mice were irradiated continuously with x rays (120 kvp, HVL 0.8 mm Cu) from the age of 78 days until their death. In the male animals at a dose rate of 2.5 R/

day a mean life shortening of 29% and mean accumulated dose of 1225 R was found; at 1.2 R/day the value was 14% or 712 R. In the female mice the life duration was heavily affected by a high spontaneous tumor rate, but the radio-induced life shortening was not significantly different from that of the males. The experiments suggested that the relative biological efficiency of medium hard radiation for the radio-induced life shortening is three in comparison to γ radiation. (tr-auth)

45444 EKG MODIFICATIONS OF WHITE MICE UNDER IRRADIATION WITH HIGH X RAY DOSES. Rajewsky, B.; Wilhelm, G.; Frankenberg, D. (Max-Planck-Institut fuer Biophysik, Frankfurt am Main). Strahlentherapie, Sonderbaende, 62: 187-93(1966). (In German).

It is shown from the EKG of irradiated animals that the instant of increase of the K content in the extracellular space depends on the height of the radiation dose administered. The K increase can be observed earlier with a higher radiation dose. A hyperkalemia occurs after irradiation with the doses used. The extent of the effect of the hyperkalemia on the incidence of cramps and on the death of the animal cannot be derived from the research results. The tonic-klonic cramps at increasing hyperkalemia can be eliminated by narcosis and the survival time of the mice irradiated with 180 kR can be increased from 90 sec on an average to 35 min on an average. Potassium determinations were made on isolated cells after irradiation with various doses. It was established that after a radiation dose of 50 kR 25% of the intracellular K was eliminated from the cell after one hour and at a dose of 100 kR 30% of the K was removed. The studies on isolated cells showed that under the effect of x radiation a K elimination from the cells occurred. The extent of this escape is dose dependent. These results can be a basis for the increase of the K concentration in the extracellular fluid. At a radiation dose of 50 kR an elimination of 25% of the intracellular K was observed, whereas after 46 kR an increase of the extracellular K concentration could be detected after two hours. The basis for the differing behavior of isolated cells and mammalian organisms is unknown. (tr-auth)

45445 ELECTROLYTE TRANSPORT IN ASCITES TUMOR CELLS AFTER X RADIATION. Hasl, Guenther; Pauly, Helmut; Rajewsky, Boris (Max-Planck-Institut fuer Biophysik, Frankfurt am Main). Strahlentherapie, Sonderbaende, 62: 194-7(1966). (In German).

The radiation dose that leads to a disturbance of the electrolyte content in isolated irradiated cells was investigated. Ascites tumor cells were irradiated at doses of 300 and 400 kR and the K exchange after irradiation was determined as a function of time and of the dose using ^{42}K as tracer. The results showed that the K transport of the ascites tumor cell is very radiation resistant. After a dose of 300 kR the cell can still be enriched in K. The irreversible damage of the transport mechanism follows radiation doses which lead to very sharp perturbation of the cell respiration and glucolysis. (J.S.R.)

45446 INVESTIGATION OF THE RELATION BETWEEN LOCAL AND GENERAL RADIOSENSITIVITY. Rausch, Ludwig; Ander, Elke (Univ., Giessen, Ger.). Strahlentherapie, Sonderbaende, 62: 198-205(1966). (In German).

The correlation between local and general radiosensitivity was investigated on the basis of four local radiation reactions and subsequent whole-body irradiation and on the basis of sublethal whole-body irradiation and subsequent lethal whole-body irradiation of mice. A correlation could not be detected. The correlation between the two parameters for the general radiosensitivity is weak and points to its limited utility as a parameter for the representation of general radiosensitivity. (tr-auth)

45447 RELATIVE NITROGEN BALANCE DETERMINATION IN RADIOTHERAPY. Alth, Gerhart (Wilhelminenspitales, Vienna). Strahlentherapie, Sonderbaende, 62: 206-9(1966). (In German).

Under constant protein feeding conditions and irradiation modalities a clear catabolic effect can be detected by determination of the total urea elimination in the urine per local x irradiation. The question of whether the increased urea elimination was a result of tumor incidence, a general radiation reaction, or a combination of several radioinduced factors could not be answered. The urea increase could be greatly decreased by the administration of anabolic materials. The simultaneous application of x irradiation with catabolic-acting corticosteroids could be problematic because of dangerous accumulation of the catabolic factors. (tr-auth)

45448 EFFECT OF RADIATION BURDEN ON THE ACTION OF MEDICINE. Frik, Wolfgang (Univ., Erlangen, Ger.). Strahlentherapie, Sonderbaende, 62: 234-9 (1966). (In German).

The change of the LD_{50} of 64 medicines on the fourth day after whole-body irradiation of male mice of the NMRI strain at a dose of 500 R with a radiation quality of 1.1 mm Cu half-value width was investigated. The results are tabulated. (J.S.R.)

45449 RADIO-INDUCED FETUS DAMAGE. Trautmann, Johannes (Staedtische Krankenhauses Moabit, Berlin). Strahlentherapie, Sonderbaende, 62: 240-3(1966). (In German).

The present knowledge on the radioinduced fetal damage in man is briefly summarized in order to indicate the need for extensive studies, especially on the effects of low radiation doses at various fetal stages. (J.S.R.)

45450 RELATION BETWEEN ENERGY ABSORPTION AND RADIATION EFFECT. Pohlit, Wolfgang (Max-Planck-Institut fuer Biophysik, Frankfurt am Main). Strahlentherapie, Sonderbaende, 62: 280-92(1966). (In German).

The manner in which the relation, important for radiotherapy, between the energy absorption and the radiation effect depends on the engineer in the construction of optimum radiation apparatus and on the radiation physicists in the determination of optimum radiation planes and the dose at the focus. Both are concerned with the macroscopic distribution of absorbed radiation in the body. For the carrying out of an optimum radiation plan, the radiotherapists need radiobiological principles on the relation between the microscopic distribution of the energy absorption and the radiation effect in complicated living organisms. The physical and chemical primary reactions, the microscopic distribution of the energy in the cell, the cell cybernetics, and the radiation effect on living cells in various complicated combinations were individually explained and the relations existing between them were indicated. (tr-auth)

45451 OCULAR HAZARDS DUE TO NUCLEAR EXPLOSIONS. Lubow, Martin (William Beaumont General Hospital, El Paso, Tex.). Surv. Ophthalmol., 9: 244-51(June 1964).

The effects of blast, thermal radiation, and ionizing radiation from thermonuclear explosions on the eye are reviewed. Evaluation of the ocular hazards involved in exposure to nuclear explosions indicates that the blast effects will produce the greatest number of casualties of concern to the ophthalmic surgeon. The injury types will be similar to those seen with high explosive injuries in the past, except for the probability of increased damage from glass fragments in urban areas. The explosion of the 20-kton nominal weapon can be compared to the intensity of 100 suns, with a spectral distribution equivalent to that of a black body radiating at a temperature of 5800°K. Thermal effects of such a detonation on unshielded eyes are described in detail. Larger nuclear weapon yields will not change the ocular hazard appreciably. A night detonation would significantly impair visual efficiency because of flash blindness. The hazard of chorioretinal burns in persons looking toward the fireball is also greatly increased at night. Corneal dystrophies, iris lesions, and secondary glaucoma have not been found in persons exposed to 20-kton nuclear bursts, but might be with larger weapons. Consideration is being given to the development of lightweight plastic safety lenses with an incorporated filter

component. Standard sunglasses and other nonspecific filter devices inadequately block thermal radiations and may give false feelings of security among observers. The use of mild myotics for exposed military personnel also may decrease incident radiant energy to the retina. Although total casualties may be less, radiation effects will be proportionally greater when using small tactical nuclear weapons in the low kton range. (TSS)

45452 EFFECT OF IRRADIATION OF WHEAT ENDOSPERMS ON THE GROWTH AND DEVELOPMENT OF THE PLANTS. Fonshtein, L. M. (Inst. of Genetics, Academy of Sciences, USSR). Tr. Inst. Genet., Akad. Nauk SSSR, No. 28, 153-7(1961). (In Russian).

Transplanting of a nonirradiated wheat embryo on an endosperm irradiated with 100,000 and 500,000 R ^{60}Co γ radiation leads to a significant inhibition of seedling growth (length of seedlings, length of radicles, weight of seedlings). Treated plants started to ear later than the controls and produced a slightly lower grain yield per plant. Transplanting of a nonirradiated wheat embryo on an irradiated endosperm lead to the same radiation depression due to rays emitted by the developing plant, as direct irradiation of the embryo, but to a lesser degree. Probably, inhibition of growth of nonirradiated embryos transplanted on an irradiated endosperm is caused by the appearance of abnormal metabolites in the exchanges of matter between embryo and endosperm. (auth)

45453 EFFECT OF IONIZING RADIATION ON THE PHYSIOLOGICAL-BIOCHEMICAL PROPERTIES AND METABOLISM OF AGRICULTURAL PLANTS. Vlasyuk, P. A. Tr. Pervoi Resp. Nauchn. Konf. Fiziologov Biokhimikov Rast. Moldavii, Akad. Nauk Moldavsk. SSR, Inst. Fiziol. i Biokhim. Rast., 1964, 24-31(1964). (In Russian).

Exposure of the seeds of carrot, tomato, flax, and radish to small doses (100 to 3,000 R) of α, β, γ, or thermal neutrons caused an increase in the growth of plants grown from the seeds. These plants showed an increase in the synthesis of nucleic acids, photosynthetic activities in chloroplasts, and changes in the activity of oxidative enzymes. Exposure to large doses (10^3 to 10^4 R) damaged the metabolism of plants and caused degeneration of meristematic tissues. (C.H.)

45454 SPECIFICITY OF REPARATION MECHANISMS OF THE BACTERIAL CELL AFTER UV- AND X-RAY DAMAGE. Zhestyanikov, V. D. (Inst. of Cytology, Leningrad). Tsitologiya, 8: 404-9(May-June 1966). (In Russian).

The cultivation of E. coli B_{s-1} strain under a continuous γ-irradiation resulted in obtaining the mutant E. coli B_{s-1} γR. The latter, like E. coli B/r is x-ray resistant. However like E. coli B_{s-1}, it is uv sensitive and lacks the ability to restore the uv-irradiated phage T-1. The α-patterns sensitivity of B_{s-1} γR were not found to be significantly different from that of B_{s-1}, B, B/r and BγR strains. The above properties of the mutant B_{s-1} γR are conditioned by its ability to repair x-ray damage and its inability to restore after uv-damage. This may suggest the existence of some specific peculiarities in the reparation mechanisms after uv and x-damages in E. coli cells. (auth)

45455 IONIZING RADIATION FOR PRESOWING TREATMENT OF CORN SEED. Berezina, N. M.; Riza-Zade, R. R. Vestn. Sel'skokhoz. Nauki, Min. Sel'sk. Khoz. SSSR, 10: 10-14(1965). (In Russian).

Corn seeds were exposed to 500 R γ radiation from a ^{137}Cs source. The plants from irradiated seeds were taller than the controls, the size of ears and number of ears per plant were significantly increased, and the feed value of all plant parts was increased. Protein content was increased in all parts except husks, fat was increased in all parts, and starch was increased in all parts except leaves and husks. (C.H.)

45456 EFFECT OF GENERAL X-IRRADIATION ON THE AMINATION PROCESSES IN THE LIVER AND KIDNEYS. Novik, V. A. Vestsi Akad. Navuk BSSR, Ser. Biyal. Navuk, No. 1, 130-1(1965). (In Russian).

White male rats were exposed to 700 R x radiation and 1, 10, 20, 30, 60, and 120 days post-irradiation the animals were decapitated and the liver and kidney were examined. The intensity of amination processes was estimated by the increased content of amino N. The irradiation resulted in high inhibition of processes of direct amination in the liver after the application of pyrotartaric and α-ketoglutaric acids as amination substrates. Changes of the amination processes in the kidney were substantially smaller than in the liver. (C.H.)

45457 EFFECT OF IONIZING RADIATION ON INFECTION AND IMMUNITY. Pritulin, P. I. Veterinariya, No. 12, 9-11(1965). (In Russian).

Original work and literature on the changes in immunobiological reactivity of organisms subjected to ionizing radiation are discussed. The protective barrier functions of the organism are suppressed and permeability is disturbed so that in the second phase of radiation sickness the irradiated animals are susceptible to infections. Inflammatory reactions are distorted, phagocytic activity of leukocytes is decreased, and the humoral medium of the organism is changed. The gamma-globulin titer is reduced while the alpha- and beta-globulins are simultaneously increased. Barrier-functioning properties of lymphatic nodes and subcutaneous connecting tissue as well as allergic and anaphylactic reactions of the cells are weakened or eliminated in irradiated animals. (CFSTI)

45458 VARIATIONS IN THE LYMPHOCYTE/NEUTROPHIL INDEX IN ACUTE RADIATION SICKNESS. Sheytanov, G. Voenno-Med. Delo, 21: No. 3, 46-51(June 1966). (In Bulgarian).

Guinea pigs were given x ray doses of 5 to 1000 R. Differential blood counts were made in smears of peripheral blood of the irradiated animals and the lymphocyte to neutrophil ratio (L/N index) was determined in the 3rd hour and on the 1st to 30th day after irradiation. The L/N index exhibited more pronounced changes than other white blood indices. In the 3rd hour L/N showed decreases from normal that increased in a regular manner with the magnitude of the dose to which the animals were exposed. By using the value of L/N determined in the 3rd hr after irradiation, a dose curve may be established with a considerable degree of precision, hence a prognosis of radiation injury. On the 5th day after irradiation with lethal doses, the values of L/N showed regular increases depending on the dose with which the animals were irradiated. (CFSTI)

45459 CHANGE OF THE PHAGOCYTIC ACTIVITY OF LEUKOCYTES IN PATIENTS WITH THE CERVIX UTERI CANCER IN RADIOTHERAPY. Sokolova, N. M.; Klechikov, L. Z.; Saridzhalinskaya, E. K. (Inst. of Oncology, Leningrad). Vop. Onkol., 12: No. 6, 32-5(1966). (In Russian).

In the majority of 30 patients subjected to combined internal ^{60}Co irradiation (1.300 to 1.500 mgh) and x-ray therapy (1.000 to 2.000 R) a stimulation of the phagocytic reaction was found. Redoubling of the total dose of radiation resulted in decrease of the leucocyte phagocytic activity. Phagocytic indices after 4 to 5 applications of ^{60}Co and x-ray therapy were lower than those before treatment. (auth)

45460 INFLUENCE OF IRRADIATION ON LARYNGEAL TISSUES IN CANCER. CLINICAL AND MORPHOLOGICAL OBSERVATIONS. Rabinovich, R. M.; Cherkasskii, L. A. (Inst. of Oncology, Leningrad. Central Research Roentgeno-Radiological Inst., Leningrad). Vop. Onkol., 12: No. 6, 39-45(1966). (In Russian).

Roentgeno-morphological analysis in 24 patients subjected to radiotherapy for laryngeal cancer revealed that edema and plasmocytic infiltration are the anatomical substrate of alterations that were roentgenologically detectable in soft tissues of irradiated larynx affected with cancer. Alteration of the ground substance and cellular degeneration were found in laryngeal cartilages. (auth)

45461 ON THE PROBLEM OF THE FOEHN SICKNESS. Frey, W. Wien. Klin. Wochensch;, 77: 125-8(1965). (In German).

The disturbances of the autonomic nervous system that are associated with the foehn (an alpine wind) include increased temperature, increased circulation, and decreased stroke volume. Arterial pressure and pulse are altered only slightly. Headache, anxiety, insomnia, and muscular pains are also symptoms of the foehn sickness, which is found almost entirely in the Alps, where the surface granite is characterized by a relatively high concentration of Ra and Th. The activity in rivers amounts to 6×10^{-15} C/ml. In Lake Grimsel it is 28×10^{-15} C/ml. Normally, the Rn concentration in air is $\sim 1.3 \times 10^{-16}$ C/ml. At altitudes of 675 m the concentration is 0.25 to 0.3×10^{-15} C/ml, but during a south or southeast wind these values increase to 0.5 to 1.3×10^{-15} C/ml. During a southern foehn a value of 1.5×10^{-15} C/ml has been measured. The clinical effects of the foehn are similar to the experimental effects of Rn because of the primary sympathetic effects and subsequent vagotonia produced. All efforts to explain the effect of the foehn by direct effects of physical factors, such as ions, alterations of electrical field, temperature variations, and atmospheric pressure changes, have failed. The author suggests that foehn sickness might result from inhalation of increased amounts of Rn that are present in the atmosphere when the foehn blows. (BBB)

45462 INFLUENCE OF TEMPERATURE ON THE RADIATION SENSITIVITY OF T_1 BACTERIOPHAGES. Hermann, Klaus-Otto (Kernforschungszentrum, Karlsruhe, Ger.). Z. Naturforsch., 21b: 678-82(July 1966). (In German).

The radiosensitivity of dry bacteriophage was determined in vacuo at temperatures varying continuously between 100° and 300°K using 2-Mev protons. The influence of added cystamine and of base substitution by 5-bromouracil was investigated in the same range of temperatures. The correlation between inactivation cross section and temperature shows that two mechanisms of inactivation are present, one being independent of temperature, the other having an activation energy of about 1 kcal/mole. The first mechanism is ascribed to direct radiation action, while the temperature dependent component probably originates from small diffusible radicals. (auth)

45463 EFFECT OF IONIZING RADIATIONS ON BACTERIAL RIBOSOMES. Ganguly, P. (Saha Inst. of Nuclear Physics, Calcutta). Z. Naturforsch., 21b: 711-12(July 1966).

When crude extracts of bacteria are analyzed in the ultracentrifuge several discrete classes of ribosomes are observed. In E. coli six components with sedimentation coefficients of 20S, 30S, 50S, 70S, 85S, and 100S have been reported. Under a variety of conditions the 70S and 100S components dissociate reversibly and asymmetrically into smaller units, e.g. on removal of Mg by dialysis. The results of sedimentation analysis of crude extracts of E. coli irradiated in vitro with x- and β rays are reported. (auth)

45464 STUDIES ON SELECTION OF MICROMUTATIONS IN BARLEY. Gaul, H.; Mittelstenscheid, L. (Max-Planck-Institut fuer Zuechtungsforschung, Cologne). Z. Pflanzensuecht., 45: 300-14(1961). (In German).

Seeds of the summer barley variety Haisa II and the winter barley variety Breustedts Atlas were exposed to 150-kv x rays in doses which gave 10 to 30% survival of the M_1 plants. A total of 56 early-heading mutants was obtained. Preliminary tests of the early-heading mutants in the barley variety Haisa II indicated that 10 to 20% are higher yielding than the original variety, under growing conditions at Cologne. By use of random-selected, normal-appearing M_2 plants as source material, lines with increased grain size were obtained by repeated selection. Since there was a high correlation between the results in three years of testing, it appears that the increase in 1000-kernel weight has a genetic basis. Variability of yield in single-spike progenies arising from normal-appearing M_2 plants was compared with the variability present in the original variety (Haisa II). Variance of the mean single-plant yield was two to three times as great in the x-irradiated progenies as in the nonirradiated controls. In the same material, the mean single-plant yield of x-irradiated progenies was the same or similar to that of the nonirradiated material. Yield records were taken on single-spike progenies from about 5000 normal-appearing M_2 plants. The highest yielding 10% were subjected to a micro-drill test in the M_4 generation. Two-thirds of these lines exceeded the control (original variety) in yield, indicating that selection for increased yield had been achieved. (BBB)

45465 STUDIES ON SO-CALLED RADIOTOXINS. Schmid, A.; Zipf, K.; Gutschow, K. (Univ., Munich). Zentralbl. Veterinaermed., 12: 567-70(Dec. 1965). (In German)

Normal male rats were given injections of serum from donor rats exposed to whole-body doses of 150, 500, 1000, and 5000 rad of copper-filtered 60-kv x rays. In the following eight hours the leukocyte counts were determined. Donor serum after 150 to 500 rad caused a more marked depression, and serum after 1000 and 5000 rad a less marked depression, than normal serum. Serum from animals given 150 and 500 rad, but not from those given 1000 and 5000 rad produced fluctuations in counts similar to those produced by whole-body irradiation with small doses. That is, there was a sharp drop in total leukocytes the first hour postirradiation, followed by a rise in the second hour, and another drop in the third to fourth hour. To explain these results, several possibilities are discussed. High radiation doses in donor animals may lead to neutralization of so-called radiotoxin and thereby to inhibition of serum activity. (BBB)

45466 CONCERNING THE SYSTEM IN THE REACTION OF BIOLOGICAL OBJECTS TO RADIATION. EXPERIMENTS ON GRANARY WEEVILS. Bychkovskaya, I. G.; Ochinskaya, G. K. (Central Scientific Research Roentgeno-Radiological Inst., Leningrad. Lab. of Experimental Cytology and Histology, Leningrad). Zool. Zh., 45: 134-7(1966). (In Russian).

Experiments were conducted to determine the longevity of granary weevils exposed to x-ray doses ranging from 0.84 to 126 C, and whether the step-wise process of dying, characteristic of irradiated mammals, occurs also in other irradiated biological objects. The weevils were irradiated in glass test tubes, and were kept under observation for 50 days. The number of insects that perished was recorded every 3 days. The insects were kept at a temperature of 25° and humidity of 75%. The observations established that at doses of 0.84 to 2.95 C practically no insects perished; 20% of the insects died from a dose of 3.35 C; 40% from a dose of 4.2 C; a dose of 5 C killed about 80% of the weevils; a dose of 5.89 C killed 98% of the insects; and at doses of 6.7 C and higher the mortality rate was 100%. It was found also that: the average longevity of the weevils was related to the dose administered; it progressively diminished as the x-ray dose increased; that the step-wise nature of the dying process applied also to the irradiated insects. The step-wise dying process also indicates that radiation initially affects the more radiosensitive systems, gradually involving other vitally important systems as the doses are increased. (JPRS)

45467 ACTION OF IONIZING RADIATION ON ARGASID MITES. Teravskii, I. K. (Kirov Military Medical Academy, Leningrad). Zool. Zh., 45: 371-4(1966). (In Russian).

Larvae, nymphs, and adults of the Ornithodorus papillipes Bis. mite that were infected with Borrelia sogdiana, the pathogen of Central Asian spirochetosis transmitted by mites of this species, were irradiated with γ rays in doses of 50 to 10,000 R. Irradiation of the carriers with doses in this range had no effect on the spirochetes: they were still transmitted to guinea pigs and to the offspring of the mites. Doses of 2,000 R were lethal to 96% of larvae before molting and to transformation into nymphs; they also inhibited greatly the metamorphosis of all other developmental phases of the mites. Doses of 5,000 to 10,000 R, in addition to being lethal to 100% of larvae, inhibited metamorphosis completely and produced considerable lethality among

nymphs of the II to IV phases. The eggs laid by females exposed to a dose of 5,000 R did not develop, while females irradiated with 10,000 R did not lay any eggs. Irradiation with doses in the 5,000 to 10,000 R range had a sterilizing effect on males. (JPRS)

45468 ISS LEDOVANIYA NEIRORADIOEMBRIOLOGICHESKOGO EFFEKTA. (Investigation of Neuroembryoradiological Effect). Piontkovskii, I. A. (ed.). Moscow, Izdatel'stvo Nauka, 1966. 248p.

Physiological and morphological studies were conducted in rats, rabbits, and dogs exposed prenatally to ionizing radiation. The effects of dose and of age of the embryo at exposure on postnatal injuries to the central nervous system and on higher nervous activity are discussed. Post-irradiation repair of the cerebral cortex is considered. An extensive bibliography is included. (H.G.D.)

45469 THE ANALYSIS OF RADIATION INDUCED INACTIVATION AND MUTABILITY OF SACCHAROMYCES CULTURES OF VARIOUS PLOIDY DEGREES. Haefner, K. Berlin, Freie Univ., 1965. 146p. $2.00 Gmelin, AED-Diss. 65-378.

Thesis.

The effects of uv and 50-kv x rays with doses between 10 and 200 kR on various cultures of Saccharomyces are studied. Possible mechanisms of inactivation are discussed. (Gmelin Inst.)

45470 RADIATION INDUCED CHANGES OF EOSINOPHILS WITH SUB- TO SUPRA-LETHAL SINGLE WHOLE-BODY IRRADIATION OF RATS. Albertz, H. Heidelberg, Univ., 1964. 45p. $2.00 Gmelin, AED-Diss. 64-2000.

Thesis.

Single whole-body irradiation with 100 to 1000 R ^{60}Co γ rays induces eosinophil changes that are inversely proportional to radiation dose. Eosinophil values after irradiation oscillate. If regeneration occurs, overshooting eosinophil values that are much higher than the initial values are observed after 4 weeks. (Gmelin Inst.)

45471 CHEMICAL AND PHYSICAL INFLUENCES ON RADIATION EFFECTS OF COLI PHAGES. Hotz, G. Karlsruhe, Ger., Technical Univ., 1965. 80p. $2.00 Gmelin, AED-Diss. 65-364.

Thesis.

Radiation sensitivity of coliphages can be reduced by a factor of 2 to 3 by cysteine or cysteamine, dehydration, and low temperatures. Protective action of these factors is additive so that a factor of 17 can be obtained. Radiation sensitivity of T1 phages with substitution of DNA thymine by bromouracil is increased. This sensitization can be reduced by cysteine and cysteamine but not by dehydration or low temperatures. (Gmelin Inst.)

45472 ESTIMATION OF GROWTH PATTERNS OF PROTOZOA IN RADIATION EXPERIMENTS. Ross, Alan (Johns Hopkins Univ., Baltimore). 9p. (CONF-660441-1). ORAU. Gmelin, AED-CONF-66-118-1.

From Biometric Society Inst. of Mathematical Statistics, Eastern Regions Joint Meeting, Upton, N. Y.

Mathematical models are presented for use in estimation of the effects of x radiation on growth patterns of Paramecium aurelia. (C.H.)

45473 COMPARISON OF TOLERANCE TO DONOR SKIN GRAFTS AND PRESENCE OF DONOR-TYPE GAMMA-GLOBULIN IN ALLOGENEIC RADIATION CHIMERAS. Halpern, Barry L.; Glynn, John P. (National Cancer Inst., Bethesda, Md.). 10p. (CONF-651215-1). ORAU. Gmelin, AED-CONF-65-455-1.

From Bone Marrow Transplantation and Radiation Recovery Conference, San Francisco.

Donor-type hematopoietic tissue (as determined by the presence of donor-type red blood cells and γ-globulin) persisted in $CBF_1 \rightarrow$ BALB/c 500 to 700 R irradiated mouse chimeras, after donor-type skin grafts were rejected. There was complete correlation between presence of donor-type γ-globulin and donor-type erythrocytes. In the $CDF_1 \rightarrow$ BALB/c system, an insufficient number of skin graft rejections occurred to warrant any generalization, however in those few animals that rejected CDF_1 skin grafts, donor-type γ-globulin persisted. In both systems, the presence of donor-type γ-globulin was detected at least 30 days after skin graft rejection. (auth)

45474 SOMATIC MUTATIONS IN THE CARNATION INDUCED BY GAMMA RADIATION. Buiatti, M.; Ragazzini, R.; D'Amato, F. (Univ., Pisa, Italy). 5p. (CONF-551-7). ORAU.

From Technical Meeting on the Use of Induced Mutations in Plant Breeding Programs, Rome, May-June 1964.

Rooted cuttings of the carnation, Dianthus caryophillus, were irradiated with four doses of γ rays from ^{60}Co (6, 7.5, 10, and 12 kR). Two varieties were used: Cardinal Sim, with semidouble red (Orient Red 819 in Wilson Color Chart) flowers, and Elia rosso with semidouble red (Geranium lake 20) flowers. Analysis of the radiation induced changes was carried out separately for first-emerged and later-emerged branches in the plants grown from the irradiated cuttings (M_1). A second analysis was made on the plants obtained by vegetative propagation of the M_1 (vM_2). The frequencies of chlorophyll deficient sectors per plant and per branch were roughly proportional to dose. Four changes in flower color (Rose Opale, Peach, white with central red stripes and white-variegated red) were obtained in Elia rosso and one (white) in Cardinal Sim: almost all changes showed up as partial, i.e., branches with normal and mutated flowers or flower portions. The mutation frequencies for flower color found in our experiments are comparable to those observed by Sagawa and Mehlquist (1957) in the carnation William Sim. Mutation frequencies in the first-emerged branches were higher than in the later-emerged ones; they decreased progressively with increasing order of emergence of the branches. Induced waxless mutations were rather common in Elia rosso. It could be ascertained that lateral branches of the third order were still chimerical. Analysis of the number of petals in M_1 flowers did not show any significant effect of the treatment on means, but revealed an increase in variability roughly proportional to dose. This finding might indicate that the number of petals is controlled by a polygenic system. (auth)

45475 EFFECTS OF UV IRRADIATION ON INFECTION OF L CELLS WITH ENCEPHALOMYOCARDITIS VIRUS. Balduzzi, Piero 10p. (CONF-660539-1). ORAU. Gmelin, AED-CONF-66-114-1.

From American Society for Microbiology, 66th Annual Meeting, Los Angeles.

The effects of ultraviolet radiation on the infectivity of cultured mouse L cells for encephalomyocarditis (EMC) virus and the reproduction of the virus on infected cells were studied. The capacity of EMC virus for reproduction was found to be less on uv-irradiated cells than that of free virus. The sensitivity of reproduction was also modified by the multiplicity of infection. It is suggested that some structures exist with which the virus must interact in order to multiply or that several virus particles interact functionally to bring about a successful replication cycle. Possible reaction mechanisms affecting the radiosensitivity of viral multiplication are discussed. (C.H.)

45476 EFFECT OF MUTAGENIC AGENTS IN VICIA SATIVA L. COMPARISON BETWEEN EFFECTS OF ETHYL METHANE SULFONATE, ETHYLENE IMINE AND X-RAYS ON INDUCTION OF CHLOROPHYLL MUTATIONS. Zannone, L. (Instituto Nazionale di Genetica per la Cerealicoltura N. Strampelli, Rome). 9p. (CONF-551-5). ORAU.

From Technical Meeting on the Use of Induced Mutations in Plant Breeding Programs, Rome, May-June 1964.

Dormant seeds of two lines of Vicia sativa L. were treated with the following mutagens: ethyl methane sulfonate, ethyleneimine, or x rays. Inferences drawn on frequencies of chlorophyll mutations observed in M_2 progenies at the seedling stage were described in a summary paper at the Italian Genetic Association Scientific Meeting (Turin, 1962). Data are now analyzed for each treatment in relation

to the different types of chlorophyll mutants observed and classified as follows: lack of chlorophyll (lethal), delayed or interrupted synthesis of chlorophyll (semi-lethal), and lack of chlorophyll and faulty anthocyanins (viable). Mutative spectra in the different treatments do not reveal statistically appreciable differences. Data on frequencies of chlorophyll mutations are compared with those on growth reduction reported at the VI Nuclear Meeting (Rome, 1961) and with those on chromosome aberrations previously reported. The comparison shows the high mutagenic action of ethyl methane sulfonate per se and in relation to the cytological damage. (auth)

Radiation Effects Therapy and Countermeasures

45477 THE RADIOSENSITIVITY OF ESCHERICHIA COLI B CULTURES. III. PRE- AND POST-IRRADIATION EFFECT OF COMPOUNDS OF THE CYSTEINE AND CYSTEAMINE TYPE. Nagy, Zs.; Hernadi, F.; Kovacs, P.; Bekesi, I. (Medical Univ., Debrecen). Acta Biol. Acad. Sci. Hung., 17: 223-31(1966).

The protective effect afforded by cysteine, cysteamine, and penicillamine against the lethal effect of x irradiation on E. coli B cell suspensions was examined. It is shown that the effects of these compounds are time- and temperature-dependent and possess a pre- and post-irradiation effect. This protective effect can be significantly increased if the bacterial suspension to be protected is incubated for 30 min at 37°C prior to irradiation in the presence of the above compounds, the incubation of cysteamine lasting 15 min and that of cysteine, penicillamine 30 min. This radioprotective effect can also be achieved by incubating the cell-suspensions for 30 min between the end of the irradiation period and plating. The results obtained render the supposition admissible that the protective effect on E. coli B of the above compounds seems to be both of a physico-chemical and of a metabolic character. It appears, moreover, that the compounds are able to increase rate of survival of the damaged cells by means of influencing so-called methionic reaction taking place after irradiation. (auth)

45478 DETECTION OF PHOTOSENSITIZERS IN TISSUE. Becker, S. W. Jr.; West, Bob (Univ. of Illinois, Chicago). Arch. Dermatol., 94: 457-61(Oct. 1965).

Methoxsalen (Oxsoralen), a naturally occurring furocoumarin, has been used to produce therapeutic photochemical reactions for many years. In the lab, eye damage has been produced in albino mice and guinea pigs when they were photosensitized with methoxsalen, but there has been no deleterious effect to the eyes reported in the many patients who have used the product. Tests to assess the safety of this compound in animals exposed to uv light were conducted. Dogs and rabbits that were male albino or brown and black pigmented, were utilized for this study. Rabbits were exposed five days per week during the two-week study period. The only light source provided in the room during the 20-min exposure periods was the long-wave uv light (320-400 mμ). Rabbits and dogs sensitized with 4,5,8-trimethylpsoralen and exposed to longwave uv light suffered no eye damage. Clinical examination immediately after treatment revealed no change nor did study of histologic sections of the fixed eye. No photoreactive residue was found in the eye using a microbiologic technique of testing. (BBB)

45479 PHYSIOLOGICAL STUDIES OF PRIMITIVE HEMOPOIETIC CELLS. Gurney, Clifford W.; Hofstra, Diana; Mangalik, Aroop (Univ. of Chicago). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 17-29(1965).

The action of erythropoietin on primitive hemopoietic cells is to induce differentiation into the red cell series. The result of this process can be measured quantitatively, and therefore may be employed in an inquiry into the nature and proliferative potential of these cells. Three separate experiments are presented which suggest the multipotential nature of the primitive cell upon which erythropoietin acts. First, when erythropoiesis in mice has been eliminated by transfusion, the pool of primitive cells which is potentially responsive to erythropoietin is not dormant, but rather is a dynamic pool, as demonstrated by tritiated thymidine in proerythroblasts induced by erythropoietin, even when the tritiated thymidine was administered before the erythropoietin. Second, the pool of erythropoietin-responsive cells in the sub-lethally x irradiated plethoric mouse recovers in the absence of any red cell production. Third, the recovery of the pool of erythropoietin-responsive cells is retarded when irradiated animals are subjected to an inflammatory process characterized by a massive polymorphonuclear infiltration (and presumably, increased leukocyte production). The pattern of proliferation of a small group of protected erythropoietin-responsive cells was followed by shielding the spleens of plethoric mice subsequently given large doses of irradiation, and observing the response to a challenging dose of erythropoietin administered to different groups of animals at different times. Proliferation of these cells was rapid, with an overshot on the eighth day to 140% of normal. Organ uptake of radioiron indicated the proliferation was initially in the spleen, but in a few days after irradiation the erythropoietin sensitive cells had migrated out to the bone marrow. These results enable us to present formulations as to the regulatory processes governing the size of the pool of cells responsive to erythropoietin, and the techniques utilized in these studies, in conjunction with methods employed by others, should ultimately lead to an elucidation of these regulatory processes. (auth)

45480 COMPENSATING PROLIFERATION OF HEMOPOIETIC TISSUES. Lajtha, L. G. (Christie Hospital and Holt Radium Inst., Manchester, Eng.). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 37-44(1965).

The bone marrow is one of the organs in which proliferation compensating for cellular loss can be demonstrated. This proliferation involves a number of interconnected cell populations from the differentiating bone marrow cells back to the stem cell populations. In view of recent experimental evidence, at present two kinds of stem cells have to be postulated, the undifferentiated stem cells which have a fast growth rate and give rise to the differentiated cells, and the colonizing cells which have a slower population growth as shown by serial grafting experiments. Three major perturbations, blood loss, irradiation, and grafting, are taken as examples, and the sequence of events, with respect to feedback controls and proliferation, is discussed in detail. Emphasis is placed on the overall dynamics of the cell populations involved. (auth)

45481 PATTERN OF REGENERATION OF NITROGEN-MUSTARD TREATED MARROW AFTER TRANSFUSION INTO LETHALLY IRRADIATED HOMOLOGOUS RECIPIENTS. Fliedner, T. M. (Freiburg i. B. Inst. of Hematology); Thomas, E. D.; Fache, I.; Thomas, D.; Cronkite, E. P. Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 45-54(1965).

An attempt was made to morphologically identify the cell type(s) that are responsible for repopulation of the bone marrow if transfused into supralethally irradiated recipients. It has been shown previously that 1 mgm per kg body weight of nitrogen mustard will produce in dog and man bone marrow aplasia, severe peripheral leukopenia, and thrombopenia within 5 days. Such an early hemopoietic failure is seen after ionizing radiation only if supralethal doses are employed. If marrow is removed from dogs four days after 1 mgm/kg body weight of nitrogen mustard, it is still capable of inducing hemopoietic recovery in homologous dogs given a supralethal dose of radiation. In dogs given 1500 R ^{60}Co whole-body irradiation, the pattern of hemopoietic recovery in bone marrow and blood was studied after transfusion of bone marrow from donor dogs that were treated with nitrogen mustard five days before removal of the marrow. A chain of cytological changes from undifferentiated small lymphoid forms to clear-cut myelocytic pre-

cursors was apparent if the marrow was transfused four days after radiation exposure, so that all radiation-injured cells had been removed. The first evidence of recovery is seen in the appearance of small lymphoid cells, actively synthesizing DNA, twelve hours after marrow transfusion. In the irradiated, but not marrow-treated control dog, practically no DNA-synthesizing cells were found during the five days of observation. 24 hours after marrow transfusion such basophilic lymphoid cells were found in mitosis. 36 hours after transfusion of nitrogen-mustard aplastic marrow, a large number of medium and large size lymphoid cells were found. At this time there was evidence of cell differentiation into forms termed hemocytoblasts. A large fraction of these cells were capable of synthesizing DNA. Hemocytoblasts of various sizes were present in large numbers after 68 hours. After 96 hours, the first differentiated clear-cut myeloid precursors were found, and at 120 hours foci of myelocytic regeneration were numerous, showing practically all stages of myelocytic maturation. Although this pattern of recovery does not establish the precise chain of morphological developments between a "stem cell" and differentiated elements, this approach of transfusing nitrogen-mustard aplastic marrow into a supralethally irradiated and marrow aplastic recipient may provide an experimental tool to identify "stem cells" and to study more of their properties. (auth)

45482 SPECIFIC IMMUNE TOLERANCE AS REPRESENTATIVE OF THE IMMUNOLOGICALLY COMPETENT CELL CONDITION OF THE ENTIRE ORGANISM. Mathe, G.; Amiel, J. L. (Hopital Paul Brousse, Villejuif, France). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 173-81 (1965). (In French).

The induction of specific tolerance seems to be linked to a lack of balance in the radio of antigen volume/number of cells that are immunologically competent. A decrease in the denominator favors the induction of tolerance; it may be asked whether this lack of balance effects the entire organism or even the cell. Mice that have been irradiated at a lethal dose and restored by 10^6 medullary cells and 2.5×10^7 isogenic lymph node cells become immunized against a heterospecific protein administered immediately after irradiation. Animals treated in parallel, but that receive only 10^5 or 0 lymph node cells, do not become immunized. Grafts of 2.5×10^7 lymph node cells sampled from donors of the latter group, do not enable normal isogenic receivers irradiated at a lethal dose to become immunized against the same hetero-specific protein, whereas animals that have been treated in this way respond normally to another antigenic stimulus, such as an allogenic skin graft. The induction of a lack of equilibrium in the ratio of antigenic stimulus/number of immunologically competent cells by means of an adequate reduction of the denominator, would thus seem to provoke, in an adult organism, and on a cellular scale, lasting modifications that are specific and transmissible by the grafting of lymphoid cells. (auth)

45483 ANTIGENS OF GRAFTS STUDIES IN THE MOUSE AND IN MAN. Adida, J.; Amiel, J. L.; Brezin, C.; Matsukura, M.; Mery, A. M.; Sekiguchi, M.; Mathe, G. (Hopital Paul Brousse, Villejuif, France). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 193-204(1965). (In French).

Various experiments were carried out in order to obtain acellular extracts from nucleated cells that contain an antigenic potency with regard to grafts in the mouse and in man. The cellular material was obtained from tumorous cells from the mouse and from the spleen by means of surgical operation in man. The fractions obtained inhibit allogenic myeloid restoration in vivo following total irradiation in the mouse; the results of inhibition of hemagglutination in vitro show the strong antigenicity of the substances obtained in the final stage of extraction and are in good parallel with the results obtained in vivo. The same methods of extraction from human spleen cells produce substances that, according to the test of the dermic reaction following preimmunization by an allogeneic skin graft of the spleen donor, proved to be active in vivo. These substances are able to inhibit serums containing antileukocyte and antithrombocyte antibodies in vitro. The substances containing the graft antigenicity thus appear to be of the same biochemical nature both in the mouse and in man. These consist probably of lipoproteins. The more active substances contained 20% of lipids. (auth)

45484 CONDITIONING OF BONE MARROW GRAFT RECIPIENT BY COMBINED RADIATION-CHEMOTHERAPY. Cole, Leonard J.; Davis, William E. Jr. (Naval Radiological Defense Lab., San Francisco). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 253-68(1965).

Two general problems relative to transplantation of allogeneic bone marrow are considered: 1) the combined treatment of the recipient with antimitotic chemicals, such as urethan, plus x radiation, in order to afford successful marrow transplantation, and to induce specific tolerance to skin homografts; 2) the relationships between degree of histocompatibility antigenic disparity between marrow or tissue donor and host, and the response of the irradiated host to the corresponding homografts. From both theoretical and experimental view points it is evident that some of the obstacles to successful allogeneic marrow transplantation in certain species derives from the inadequate suppression of the host homograft response by the radiation dose employed. Evidence is presented from spleen colony formation data showing that even at a 100% lethal x-ray exposure in mice (880 rad), there is a residual homograft response which affects the fate of an allogeneic marrow graft. The additive effect of combined radiation-chemotherapy (urethan) on the homograft response in mice may be mediated, in part, via the thymus. This is evidenced by the greater depression of thymus weight by the combined treatment, and by the more marked depletion of cortical thymic lymphocytes during the first week, and delayed thymic regeneration, as compared with irradiated controls. An example of the successful induction of long-term (more than 1 year) allogeneic marrow chimerism in the dog, conditioned with combined urethan-900 rad treatment, is given. The question arises whether the induction of homograft tolerance in sublethally irradiated mice injected with allogeneic marrow (from donors with the same H-2 allele as the recipient) is accompanied by chimerism in these recipients. Adult C3H mice (H-2k) received a sublethal dose of 500 rad followed by 2 daily iv injections of CBA/T-6 (H-2k) bone marrow or spleen cells; the irradiated controls received ultrasonically disrupted cells. Tail skin grafts of T-6 and AKR (H-2k) origin were placed the day after irradiation. Six to 7 months later, essentially all of the mitotic cells in the marrow, spleen, thymus and lymph nodes of these recipients were of donor origin, i.e., presence of T-6 marker chromosome. The irradiated control tissues were negative for the T-6 marker. The presence of this marker was associated with specific skin homograft tolerance. When allogeneic, but H-2 dissimilar, hemopoietic and lymphoid cells were transfused into 500 rad irradiated mice, the donor cells persisted only for relatively short periods, i.e., they were absent by 35 days. Thus, after a high sublethal dose of x rays, at which dose an H-2 dissimilar allogeneic graft is rejected, an H-2 similar allogeneic marrow graft is retained, and overgrows the host cells. It is postulated that greater stimulation for recovery of the surviving fraction of irradiated host's immunocompetent cells occurs, the more foreign the marrow transplant is, with respect to the host. Analogous results were obtained on the induction of permanent skin homograft tolerance in adult BALB/c mice by conditioning with urethan plus sublethal x radiation followed by the transfusion of 38×10^6 DBA/2 bone marrow cells. The mice thus treated have been shown to be chimeric by virtue of the presence of donor-type γ-globulin in their sera. The prime importance of proper histocompatibility matching for successful marrow grafting is emphasized. (auth)

45485 STUDY OF CERTAIN METABOLITES IN THE COURSE OF THE SECONDARY SYNDROME COMPLICATED BY A GRAFT OF ALLOGENIC HEMATOPOIETIC CELLS. Nordmann, R.; Arnaud, M.; Lapeyraque, F. (Clinique

Chirurgicale de la Salpetriere, Paris). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 353-63(1965). (In French).

Results are reported on a study of the comparative influence, after irradiation, of bone marrow transplantation, either isologous or homologous, on the blood and hepatic level of some metabolites playing a fundamental role in energy metabolism. The determination of these metabolites has been done by specific enzymatic methods. It appears that, in mice, isologous as well as homologous bone marrow transplantation determines a significative decrease of blood α-ketoglutarate, decrease which is thus not related to the secondary disease. Blood pyruvate and lactate levels are not different from those found in normal animals. The levels of L-malate and nicotinamide-adenine-dinucleotide (NAD^+), on the contrary, are significatively and specifically lowered in the blood of mice given homologous bone marrow. The study of the hepatic level of NAD^+ shows a decrease in the same mice starved for 24 hours. The concentration of L-malate and L-aspartate is elevated in the liver of fed mice given isologous or homologous bone marrow; the increase of liver aspartate is, however, larger after homologous bone marrow transplantation. The interpretation of these findings is discussed in correlation with abnormalities in the biosynthesis of NAD^+ as well as in the metabolism of L-aspartic and L-malic acids. The modifications of these metabolites in blood and urine have also been studied during several months in a patient after whole-body irradiation and transplantation of allogenic bone marrow. The results are compared to those found during the experimentation on mice. (auth)

45486 ENZYMATIC STUDIES IN THE COURSE OF THE SECONDARY SYNDROME. Schwarzmann, V.; Lapeyraque, F.; Berthaux, N. (Hopital Saint-Antoine, Paris). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 365-8(1965). (In French).

Several enzymes were estimated in the blood of irradiated patients in the course of secondary syndrome after homologous bone marrow grafting. The changes in enzymes activity resemble very much those recorded in chronic hepatitis, a condition which actually seems to occur as one of the features of the secondary syndrome itself. Parallel studies on livers of grafted mice failed to show any significant change related to secondary syndrome with the only exception of liver glutaminase I. Some changes in other liver enzymes bear no significance as far as the secondary syndrome is concerned since they occur both in isologous and homologous groups. They might be dependent on irradiation. (auth)

45487 AMYLOIDOSIS IN RADIATION CHIMERAS AND ITS RELATIONSHIP TO LYMPHOID HYPOPLASIA. Micklem, H. S.; Bradbury, S. (Medical Research Council, Harwell, Eng. Dept. of Human Anatomy, Oxford). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 369-71(1965).

It has long been known that mice exposed to a lethal dose of x rays may be saved from otherwise certain death by an injection of hematopoietic cells from normal mouse or rat donors. After initial recovery, during which the injected cells repopulate the tissues of the host, such mice may develop secondary disease, frequently fatal, during the second to fourth months after irradiation. Dominant histological features of this syndrome are lymphocytic atrophy and aplasia, granulopoietic hyperplasia in bone marrow, spleen, and sometimes lymph nodes, often plasmatoid hyperplasia in the lymph nodes, and deposits of hyaline material in the spleen. The disease is well known to occur when donor and host are antigenically incompatible, and is then attributable to an initial graft-versus-host immune reaction. It has however also been seen under certain conditions when donor and host are syngeneic, and in this latter situation it may be attributed to the effects of lymphoid asplasia; its onset can then be prevented by an adequate transplant of viable syngeneic lymph node cells. The incidence of hyaline deposits in the spleen and liver of a series of radiation chimaeras which died, or were found moribund, with secondary disease, and of a smaller series which were killed at various stages before or during the development of the disease was determined. The incidence of other common histological features was investigated in parallel, and the effects of injecting histocompatible lymphoid cells were noted. The hyaline deposits were identified as being amyloid in nature, closely comparable to secondary amyloid in man, by a variety of histochemical techniques and by electron microscopy. (auth)

45488 REDUCTION OF THE FREQUENCY OF THE SECONDARY SYNDROME BY CONSERVATION OF CELLS IN VARIOUS CONDITIONS. Schwarzenberg, L.; Amiel, J. L.; Mathe, G. (Hopital Paul Brousse, Villejuif, France). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 395-405(1965). (In French).

A graft of hematopoietic allogenic cells provides the receiver that has been whole-body irradiated at a lethal dose with myeloid cells that ensure its restoration and with cells that are immunologically competent which, in becoming immunized against their receiver, may provoke a lethal secondary syndrome. These two types of cells may be dissociated by their different sensitiveness to certain types of treatments. Conservation during 2 hours at 37°C in a protein-free solution (Tyrode's solution) has an effect on the induction of secondary syndromes without appearing to influence the myeloid restoration capacity of these grafts of hematopoietic allogenic cells in the mouse. Quantitative studies showed that less than 2 per cent of the cells that are immunologically competent remain active following this method of conservation, whereas no reduction whatsoever was observed in the activity of the myeloid cells. Conservation during 6 hours at 18°C in the same solution which alters the permeability to cosine to the same degree as in the case of conservation during 2 hours at 37°, had no effect on either the secondary syndromes or myeloid restoration. Conservation of a hematopoietic allogenic graft at −70°C in a solution containing dimethyl sulfoxide had an effect both on the myeloid cells and on the immunologically competent cells, but the latter appeared to be approximately 10 times more sensitive to this type of conservation. (auth)

45489 BATYL ALCOHOL TREATMENT OF LEUKOPENIA IN PATIENTS WITH CHRONIC RADIATION SICKNESS. Klimov, V. S.; Denisova, E. A.; Gorbarenko, N. I. Gig. Tr. Prof. Zabolev., No. 10, 47-9(1964). (In Russian).

Batyl alcohol was prescribed in the form of 10 mg tablets 2 to 3 times a day for 2 to 4 weeks for patients with chronic radiation sickness. The preparation was easily tolerated and did not cause any side effects. In 9 patients the number of leukocytes became normal, increased in 10, and remained unchanged in 12. The positive result was more marked in patients with a shorter duration of the disease, with a smaller degree of leukopenia, and with a better state of bone-marrow hemopoiesis. (JPRS)

45490 STUDIES ON RADIOPROTECTIVE ACTIVITY OF SULFURATED MINERAL WATERS. Di Carlo, R.; Pagnini, G.; Mollo, A. (Univ., Naples). Minerva Idroclimatol., 3: 25-9(Jan.-Mar. 1963). (In Italian).

The radioprotective effect of two types of Vanacore mineral water (one high in sulfur and the other high in sulfur and iron) from Castellammare di Stabia was tested in mice. The hydrogen sulfide content of the first mineral water sample was 0.64 μg/l and its radioactivity corresponded to 0.509 mμC/l. Five groups of male Swiss mice were treated as follows: Group I (controls) received Naples fountain water for 12 days, Group II received sulfurated mineral water for 12 days before and after x irradiation with 700 R, Group III received sulfurated mineral water after 700 R irradiation, Group IV received sulfur–iron mineral water before and after 700 R irradiation, and Group V received sulfur–iron water after 700 R irradiation. Mortality rate at 16 days postirradiation was similar for Groups I, III, IV, and V (60 to 70%), but was significantly lower (40%) for Group II, the mice of which received sulfurated water before and after exposure to x rays. The mean survival time for Group II was 11.6 days. This indicates a significant radioprotective effect of the mineral water in mice. (BBB)

45491 EFFICACY OF SULFONAMIDE THERAPY IN ACUTE RADIATION INJURY. Krustanov, D.; Bonev, L.;

Nikolov, Iv.; Aleksandrov, Tsv. (Scientific Research Inst. of Radiology and Radiation Hygiene, Sofia). Rentgenol. Radiol., 3: No. 4, 53-7(1964). (In Bulgarian).

Investigations showed that sulfonamides that irreversibly inhibit catalase activity enhance injuries in rats exposed to 540 R doses of x rays. (TSS)

45492 EXPERIMENTAL STUDIES ON THE LOCAL RADIOPROTECTIVE EFFECT OF SOME DRUGS. Khadzhidekov, G.; Tsochev, Ts., Kharbov, Iv. (Inst. for Graduate Medical Education, Sofia. Inst. for Radiology and Radiation Hygiene, Sofia). Rentgenol. Radiol., 4: No. 3, 193-9(1965). (In Bulgarian).

The radioprotective effects of vitamins, catecholamine, various other amines, carcinostatic drugs, and cytotoxic chemicals were studied in mice given 550 R doses of whole-body irradiation prior to administration of the radioprotective agent. (H.G.D.)

45493 EFFECT OF TOCOPHEROL ON RADIATION LESIONS IN THE URINARY BLADDER. Roessler, R. (Academy of Medicine, Szczecin, Poland). Rocz. Pomorskiej Akad. Med. Szczecinie, 11: 629-50(1965). (In Polish).

A review citing 122 references is provided along with a clinical study of 70 women with radioinduced bladder lesions after treatment for cervical cancer. The 70 cases were divided into three groups on the basis of severity of the lesions. All groups were treated with tocopherol. Results suggest that tocopherol has a beneficial effect on bladder lesions produced by radiotherapy because it promotes capillary formation, decreases permeability of blood vessels, and improves the consistency of connective tissue. (BBB)

45494 SIMULTANEOUS USE OF IRRADIATION AND CYTOSTATICS (E 39) IN TUMOR EXPERIMENTS. Koch, Ruprecht (Univ., Freiburg i. B.). Strahlentherapie, Sonderbaende, 62: 155-50(1966). (In German).

Studies were made on white mice to determine if the simultaneous application of whole body irradiation and E 39 caused an amplification of the destructive effects on the hematopoietic system. The results showed that on sound organs there were no dramatic reactions of the hematopoietic system in the simultaneous use of these treatments. The effect of the simultaneous treatments was also studied on various tissues. A special study was made to determine whether differences exist between radiosensitive normal tissues and tumor tissues. Spleen and thymus tissues show no significant differences in reactions to individual or simultaneous application of E 39 and irradiation. In Ehrlich ascites, E 39 strongly reduces the cell respiration but simultaneous irradiation does not increase the effect. (J.S.R.)

45495 THERAPEUTIC EFFECTS OF A STEROID ANABOLICUM AFTER WHOLE BODY IRRADIATION OF THE WHITE NMRI MOUSE. Graebner, Herbert; Weisse, Christian (Univ., Giessen, Ger.). Strahlentherapie, Sonderbaende, 62: 161-75(1966). (In German).

The therapeutic effect of a protein anabolicum on the lethal radiation damage was tested on 1,650 white mice. The following results were obtained. The survival rate was increased about 50%. A dose optimum was determined under constant whole-body irradiation with increasing doses of protein anabolicum. Radioinduced dysproteinanemia was prevented. The hemotropic and nephrotropic effect detectable in therapy with anabolic hormones in various illnesses can be confirmed in whole-body irradiation studies. (tr-auth)

45496 LOCAL EFFECTS OF CHEMICAL RADIATION PROTECTING AGENTS. Pliess, Guenther; Franke, Herbert D. (Univ., Hamburg). Strahlentherapie, Sonderbaende, 62: 210-15(1966). (In German).

A summary report is given of the results obtained over a period of years in the study of the local effects of the chemical radiation protective agents hydrocortisone, cysteine, serotonin, AET, and trophicard (a mixture of asparaginate salts). The test organ was the incisor base in growing Wistar rats, exposed to a single homogeneous irradiation of the head. The results showed that hydrocortisone exerted a slight protective effect on the edema formation. Cysteine reduced the edema and the differentiation loss of the odontoblasts only at high doses when it is given before the irradiation. Neither of these substances reduced the karyorhectic decay. This radiation reaction was increased when serotonin was administered one hour after the irradiation. A significant radiosensitization of the proliferation-active pulse cells was caused by AET before or after the irradiation. Trophicard did not modify the radiation reaction of the incisor basis. These results were compared with those obtained with other test organs, and the reasons for the differences observed were discussed. (J.S.R.)

45497 MODIFICATION OF THE RADIOTOXICOLOGICAL EFFECT OF ^{90}Sr. Kriegel, Heinz; Kohl, Irmhild (Univ., Freiburg i. B. Heiligenberg Instituts, Ger.). Strahlentherapie, Sonderbaende, 62: 219-28(1966). (In German).

A standard food enriched with stable Sr leads to a reduction of ^{90}Sr toxicity in mice when the diet was administered prophylactically. In oral administration of larger masses of stable Sr a pharmacological effect of the element is to be expected. A P-poor and a Ca-rich feeding before and after the radio-Sr introduction yields a clearly positive effect on the poisoning of ^{90}Sr. In growing rats a modification of the late radiation damage is avoided after therapeutic application of the diet. (tr-auth)

45498 ANIMAL EXPERIMENTAL CONTRIBUTION TO THE QUESTION OF COMBINATION DAMAGE. Messerschmidt, Otfried (Univ., Freiburg i. B.). Strahlentherapie, Sonderbaende, 62: 244-50(1966). (In German).

The mortality resulting from combined irradiation exposure and surgery before or after the irradiation was studied on mice. The results showed that the time interval between the irradiation and surgery played an important role in the combined effects. If the mice received a back incision four days before the irradiation, the mortality rate was half that for mice only exposed to radiation. Incisions after the irradiation increase the mortality rate, but the extent of that increase is a function of the time interval. Studies made on rats gave the same results. (J.S.R.)

45499 MODIFICATION OF THE RADIOSENSITIVITY OF THE DOG. Ladner, Hans-Adolf (Univ., Freiburg i. B.). Strahlentherapie, Sonderbaende, 62: 251-3(1966). (In German).

The protective effects of pyridoxal-5-phosphate against lethal doses of 400 and 700 R were studied in dogs. The dogs received intravenous injections immediately before and 3 and 6 days after the whole-body irradiation. At both irradiation doses, the dogs receiving the drug survived the lethal irradiation. Pyridoxal-5-phosphate also had a beneficial effect on dogs receiving both irradiation and undergoing major surgery. (J.S.R.)

45500 EFFECT OF EXOGENOUS CYTOCHROME C ON OXIDATIVE PHOSPHORYLATION IN MITOCHONDRIA ISOLATED FROM TISSUES OF IRRADIATED ANIMALS. Manoilov, S. E.; Khanson, K. P. (Central Research Inst. of Roentgenology and Radiology, Ministry of Public Health, USSR. Chemical Pharmaceutical Inst., Leningrad). Vop. Med. Khim., 10: 410-13(1964). (In Russian).

Impairments in processes of oxidative phosphorylation observed in mitochondria of spleen after irradiation are similar to the alterations caused by removal of cytochrome c from mitochondria by means of washing. In both cases the addition of exogenous cytochrome c restores the functions of mitochondria to a significant degree. (auth)

45501 METHOD OF ENHANCING THE EFFECT OF X-RAY AND RADIUM TREATMENT. Scolari, Giuseppe Enea. U. S. Patent 3,265,574. Aug. 9, 1966. Priority date Apr. 7, 1962, Italy.

Three derivatives of cyclohexanol, namely the Na salt of cyclohexanol succinate, cyclohexanol palmitate, and cyclohexanol stearate, were found to exert a marked radiosensi-

tizing effect on rats and on human tumors to x radiation or γ radiation from radium. A very low toxicity and a wide margin of tolerance to the drugs was demonstrated. Two tablets of 250 mg each were administered by mouth every 6 hr to a total dose of 2 gm during the 24 hr preceding radiation treatment or 1 gm of the drug was administered intramuscularly on the day preceding radiation treatment and 1 gm immediately before x ray treatment or during the course of radium treatment. After drug treatment, 75% of epitheloma cases treated with one-half the usual radiation dose recovered and the remaining 25% responded to diothermocoagulation. Patients with epithelial and mucous tumors recurring or resisting first radiation treatment showed 78.5% recovery after drug therapy followed by the whole x radiation dose. Patients with cutaneous and mucous neoplasms recurring or resistant to radium therapy showed complete involution of tumors in 75% of the cases given drug therapy followed by irradiation using one-half the standard dose. Methods for the preparation of high purity sodium cyclohexanol succinate are included. (C.H.)

Radiation Hazards and Protection

See also HEALTH AND SAFETY

45502 (PHS-999-RH-18) MORTALITY OF NEW ENGLAND DENTISTS, 1921-1960. Glass, Robert L. (Public Health Service, Washington, D. C. Div. of Radiological Health). May 1966. 80p. Public Health Service Free.

An epidemiological study was conducted to determine the mortality of dentists in comparison with that of the general population and of physicians. A cohort of 11,478 white male dentists practicing in New England from 1921 to 1960 has been identified from the records of the State licensing authorities. The age, date of entry to risk, and survivorship status of each dentist have been determined and age-distributed person-years at risk computed. Death certificates of deceased dentists have been searched and coded. Observed numbers of deaths from all and from selected causes have been compared with those expected if the cohort were subject to various standard death rates. Leukemia mortality has approximated that expected from several sets of standard rates, both in the entire cohort and in that group entering dental practice prior to 1921. Mortality from all causes has been less than that expected from death rates of the New England white male population and U. S. physician population, but greater than that of certain medical specialists. Cancer mortality has been significantly less than, and mortality from cardiovascular diseases about equal to, that of the general population. Suicide is the only cause of death with greater than expected mortality throughout the study period. No relationship between mortality and exposure to ionizing radiation was observed. (auth)

45503 THE THOROTRAST SPLEEN. A CONTRIBUTION TO THE PROBLEM OF SURGICAL REMOVAL OF INCORPORATED, RADIOACTIVE SUBSTANCES. Wenz, W. (Univ., Heidelberg). Arch. Klin. Chir., 311: 175-90 (Aug. 30, 1965). (In German).

Among all of the organs in which Thorotrast is deposited and thorotrastosis is produced, the spleen is the only one that can be removed, thus eliminating about 20% of the total Th in the body. The remainder deposited in other organs is unaffected by this procedure, however, and may produce granulomas, fibrotic or cirrhotic changes, or even tumors. Of the approximately 110 Th tumors reported in humans, and according to the results of animal experiments, no primary spleen tumors have ever been reported. Only two authors have reported experimentally involvement of the spleen in a generalized hemangiomatosis. In two studies that involved 500 rats, where 140 Th tumors were produced, none was observed in spleen. On the other hand, removal of the spleen is sometimes accompanied by liver cirrhosis or dystrophy. In patients bearing the deposits, splenectomy may be particularly injurious, and should be performed only if subjective injuries in the left upper abdomen are present or a Th tumor of the spleen is detected. (BBB)

45504 DERIVATION OF WORKING LIMITS FOR CONTINUOUS RELEASE RATES OF ^{90}Sr AND ^{137}Cs TO ATMOSPHERE IN A MILK PRODUCING AREA. Bryant, Pamela M. (United Kingdom Atomic Energy Authority, Harwell, Eng.). Health Phys., 12: 1393-1405(Oct. 1966).

This assessment is based on information gained mainly by analysis of fallout data on the transfer to milk of ^{90}Sr and ^{137}Cs deposited on grass. The amount of each nuclide transferred is related to the current rate of deposition and to the cumulative deposit in soil; these relations are expressed primarily in terms of annual average values applicable to the United Kingdom as a whole. These values are used to derive basic working limits for continuous release rates corresponding to working limits in milk of 800 pC ^{90}Sr/g Ca and 2×10^4 pC ^{137}Cs/l. The former is based on the limit, specified by the British Medical Research Council, of 200 pC ^{90}Sr/g Ca in bone as an annual average, and the latter on a maximum permissible annual dose of 0.5 rem. Basic working limits for release rates are subject to modifying factors, regarding, for example, agricultural variations, which may, and in some cases must, be applied when considering releases in given situations. These factors are discussed. A short-term averaging period of 1 week is recommended. Modified working limits suggested as provisional guides for purposes of planning and design, for example, are 0.4 C ^{90}Sr/week and 10 C ^{137}Cs/week for a stack of 50 m effective height at 300 m from the nearest pasture in a given situation of extreme (or unknown) agricultural characteristics in Great Britain. Basic working limits for a number of stack heights and distances are shown graphically. (auth)

45505 DECIDUOUS TEETH AS INDICATORS OF ^{226}Ra EXPOSURE. Petersen, Norman J.; Samuels, Larry D. (Public Health Service, Rockville, Md.). Health Phys., 12: 1453-60(Oct. 1966).

Deciduous teeth, when analyzed by tooth type, appeared to be valid indicators of the ingestion of water containing low levels of ^{226}Ra during the time of tooth formation. Pools of deciduous teeth from lifelong residents of thirty-five Illinois and Iowa communities served by public water supplies with ^{226}Ra levels ranging from 0.04 to 20.0 pC/l were analyzed for ^{226}Ra. The correlation between ^{226}Ra levels in water and deciduous teeth was found to be direct, apparently linear and highly significant for both incisors and cuspids-and-molars. ^{226}Ra levels in cuspids-and-molars averaged 80 percent of the levels in incisors. Some possible limitations in the use of deciduous teeth for estimating ^{226}Ra levels in community water supplies and whole-body burdens of ^{226}Ra in individuals were investigated. (auth)

45506 MEASUREMENT OF ^{210}Po IN HUMAN BLOOD. Little, J. B.; McGandy, R. B. (Harvard Univ., Boston). Nature, 211: 842-3(Aug. 20, 1966).

Blood content of ^{210}Po was related to smoking habits in a group of middle-aged men. The average ^{210}Po content in the blood of smokers was 1.72 pc/kg blood compared with 0.76 pc/kg in non-smokers. Blood samples obtained from four heavy cigarette smokers were obtained before and at regular intervals after sudden complete cessation of smoking. Blood ^{210}Po content decreased an average of 27% during the first week after smoking was stopped but changed very little during the next eight weeks. It was estimated that cigarette smokers retain an excess of about 1.5 pc/day/20 cigarettes, much of which may be cleared from the lungs in mucus and swallowed. The results indicate that small differences in chronic environmental exposure to ^{210}Po can be detected in 10-ml blood samples. (C.H.)

45507 ^{137}Cs IN EDIBLE FRESHWATER FISH. Gustafson, P. F.; Brar, S. S.; Muniak, S. E. (Argonne National Lab., Ill.). Nature, 211: 843-4(Aug. 20, 1966).

The content of ^{137}Cs in freshwater fish available commercially in the Chicago area was measured during the

first 3 months of 1965. A number of samples of ocean fish were also analyzed and showed appreciably lower concentrations of ^{137}Cs but similar ^{40}K content. The ^{137}Cs in fish depends primarily on the concentration of ^{137}Cs in the water environment, the accompanying ^{40}K content, and the position of the fish in the aquatic food chain. The K content in ocean water is ten to several hundred times that of freshwater and the greater content of ^{137}Cs in freshwater fish probably reflects the higher $^{137}Cs/K$ ratio present in freshwater. The trophic level is also a factor, as shown by the higher ^{137}Cs content in carnivorous fish as compared to plankton feeders and other non-carnivorous fish in both salt and freshwater. Calculations showed that individuals living in the United States and Canada who regularly consumed as much as a pound of carnivorous freshwater fish a day would approach the ^{137}Cs body burden of Arctic peoples who depend on caribou and reindeer as a prime source of meat in their diet. (C.H.)

45508 RADIATION AND THE ENVIRONMENT. **Seelentag, Walter (Bundesgesundheitsamt, Berlin). Roentgenpraxis, 17: 203-11(Sept. 1964). (In German).**

In 1961–62 the normal environmental irradiation in Germany amounted to a total of 110 mRem. Most of this (47%) came from terrestrial sources, 6% came from atmospheric Rn and Th, 17% from incorporation of ^{40}K, 3% from incorporation of Rn, Ra, Po, and Th, and 27% was received from cosmic irradiation. As compared to this the total irradiation from other sources amounted to a total of 45 mRem. Of this about 34% was due to medical diagnostic uses, 14% was due to medical radiotherapy, 3% was due to occupational exposure, 6% was due to irradiation from small sources, 30% was due to surface fallout, and 13% was due to incorporation of fallout. The distribution of irradiation exposures made in the course of medical use was about 25% to the head and extremities, 50% to the thorax, and 25% to all other areas, including the pelvic area and femur. There are large differences between the genetically significant dose in various countries. The values lie within the range of 9 to 150 mR/yr, although in recent years the values reported have been lower than previously. In part this is due to greater attention to radiation protection, but also past results were based on grossly overestimated values. Another factor that makes the values reported uncertain is the variability in measurement techniques by different investigators at different institutions at various times. (BBB)

45509 PRESENT POSITION OF DECORPORATION OF INHALED RADIOISOTOPES FROM THE RESPIRATORY TRACT AND THE WHOLE ORGANISM. **Schmidtke, I. (Univ., Freiburg i. B.). Zentralbl. Biol. Aerosol Forsch., 11: 420-31(1963).**

The author reviews and evaluates past reports of studies of removal of radioisotopes from lung tissue. Of the agents reported to have been used, the least effective have been epinephrine, CaI_2, Cl_2 gas, NH_4OH, india ink, and chlorpromazine. Heparin, asbestos, feldspar, and silica gel are among the substances tested that have a slight effect. In general, the more promptly the treatment is administered after exposure to the radioisotope, the more effective it is. Deposition of inhaled particles is influenced by ciliary action, mucus secretion, and the ability of the alveolar epithelium to phagocytize. For these reasons, expectorants, irritants, wetting agents, histamine, antihistamines, and ions that stimulate ciliary activity have been tested, but without much success. The most effective treatment to date is diethylenetriaminepentaacetic acid. (120 references) (BBB)

Radiotherapy and Radiodiagnosis

Refer also to abstracts 45294, 45441, 45447, and 45450.

45510 (STI-DOC-10-57) COMPUTER CALCULATION OF DOSE DISTRIBUTIONS IN RADIOTHERAPY. Report of a Panel held in Vienna, October 19-22, 1965. Technical Reports Series No. 57. (International Atomic Energy Agency, Vienna (Austria)). 215p. IAEA: $4.50; $94,50; £1.7.0; F Fr 18,-; DM 15,75.

Computer techniques are rapidly expanding in problems of external beam, and intracavitary and interstitial dosimetry. The most important result of automation dosage calculations is not simply an increase in the quantity of data but improvement in their quality as a treatment guide for therapists. A panel of 15 experts from seven countries met in Vienna with observers from the World Health Organization in October, 1965. This book contains a 24-page report and recommendations, 20 working papers, an eight-page bibliography, a glossary of technical terms, and a ten-page questionnaire used in the survey. Finally, there is a list of 27 institutions in eight countries, 13 of them in the United States, six of them in Britain, that have used computers in radiotherapeutic dosimetry. (IAEA)

45511 (UCLA-12-595, pp 33-66) NUCLEAR MEDICINE. **(California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology).**

Progress is reported in the following studies: radioisotope lung scanning in pulmonary disease; aggregated albumin labeled with various radioisotopes; estimation of differential glomerular filtration by the iothalamate renogram; safety of measuring regional cerebrocortical blood flow with radioalbumin macroaggregates; perfusion and inhalation scan studies in pulmonary emphysema; value of lung scanning in pulmonary tuberculosis; regional pulmonary blood flow in experimental atelectasis; resolution of pulmonary emboli; lung scan interpretation in pulmonary embolism; albumin macroaggregates for brain scanning and experimental basis and safety in primates; measurement of regional cortical blood flow by brain hemisphere scanning; a new quantitative external monitoring technique; lung scanning following radioaerosol inhalation; pulmonary arterial perfusion by lung scanning; bronchial patency evaluation by scanning after radioaerosol inhalation; a dual lung scanning technic for evaluation of pulmonary function; radioisotope scanning in medicine; radioisotope renography in renal vascular hypertension; pulmonary embolism detection by lung perfusion scanning radiography; arteriolar blockade studies with radioalbumin macroaggregates; regional blood flow studies with radioalbumin macroaggregates; major applications of lung perfusion scanning; radioisotope lung scanning in pulmonary tuberculosis; studies in the total body counter facility; temporal changes in tissue distribution of fluorine-18 following intravenous administration; infectivity of Gross and Rauscher leukemia viruses and their nucleic acids; attempts to induce leukemia by incubation of mouse thymus cells with leukemic cell nucleic acid; the role of allografts of thymus epithelial cells in neonatally thymectomized mice; and the role of thymus epithelial reticular cells in radiation protection. (H.L.W.)

45512 CARCINOMA OF THE CERVIX ASSOCIATED WITH PREGNANCY. **Prem, Konald A.; Makowski, Edgar L.; McKelvey, John L. (Univ. of Minnesota, Minneapolis). Amer. J. Obstet Gynecol., 95: 99-108(May 1, 1966).**

Problems of fetal irradiation are considered in a report on the radiation treatment of 100 women for cervical carcinoma during pregnancy. By means of 400 kv x ray or cobalt-60 units, Stage I and II lesions received 3000 to 3300 rad over a 4-week period delivered diffusely to the midpelvis from five fields. Stage III and IV carcinomas received 3500 or 3850 rad of x ray or cobalt, respectively. Usually on the day of completion of external irradiation, multiple radium sources were inserted into the uterus and upper vagina. (50 mg for 100 hr). The arrangement of radium, which is shown, provides about 12,000 to 20,000 R to the cervix; 4500 to 5000 to point A; and 1800 to 2000 to point B. In the first and second trimesters, external radiation therapy was begun without regard for the pregnancy. When it could be determined, fetal death from external radiation usually occurred in the third or fourth week of treatment. Spontaneous abortion was allowed to occur with as little interruption in the plan of therapy as possible. Intervals in days between beginning of radiation

therapy and abortion are shown for various trimesters. Abortion usually occurred earlier among women in the first than in the second trimester, although several patients in each trimester completed the entire course of external and radium therapy before aborting. The results of irradiation treatment in this series of pregnant women with carcinoma of the cervix were comparable in all trimesters of pregnancy to results obtained by the same irradiation techniques among nonpregnant women. The deliberate delay of treatment in the third trimester to reduce the fetal hazard from prematurity did not appear to adversely affect the prognosis. (BBB)

45513 RADIOTHERAPY FOR MALIGNANT LYMPHOMAS. Easson, Eric C. (Christie Hospital and Holt Radium Inst., Manchester, Eng.). Ann. Rev. Med., 17: 179-96(1966).

Fundamental aspects of cancer radiotherapy are reviewed, including differential tumor sensitivity and methods for preventing injury to healthy tissue. The immediate effects of ionizing radiation on tissues are described. Late tissue changes are discussed. Viability is affected by the degree of postradiation fibrosis and ischemia, and the ultimate functional derangement therefore is directly related to total dose, the latter connoting quantity of radiation, total time, number of fractions, and the volume of tissue irradiated. It is suggested that the temptation to irradiate more and more extensive lesions is likely to end in failure to cure the potentially curable patient on the one hand, and more important, to increase the risks and morbidity associated with large-volume irradiation. There is insufficient data as to optimal dosage levels for the lymphomas, and it would seem prudent, therefore, when cure is the therapeutic objective, to seek higher rather than lower dose levels. The more the volume is increased, the more must dose be adjusted downwards if risks are to be controlled. Dysphagia limits the dose when the head and neck are irradiated, and diarrhea and marrow depression inhibit substantial dosage to the abdomen. Moreover, in irradiating the abdomen, dose and volumes must be planned to avoid morbidity such as from radiation nephritis, malabsorption problems, and fluid and electrolyte imbalance. The inclusion of the spinal cord in elongated fields of irradiation enhances the risks of transverse myelitis. Though it is essential to avoid overdosage to large tissue volumes, there is a need to explore the possibilities of extending the techniques of radical treatment. (BBB)

45514 RADIATION REACTIONS OF THE HUMAN LUNG FOLLOWING IRRADIATION OF BRONCHIAL CARCINOMAS. Mateev, B.; Schroeder, H. (Medizinisch-Biologisches Forschungszentrum, Berlin). Arch. Geschwulstforsch., 22: 173-82(1963). (In German).

Relations between irradiation treatment of 28 patients with histologically verified bronchial carcinoma and appearance of pneumonitis and radiation fibrosis were studied. Irradiations consisted of 250 R given daily from a ^{60}Co source dorsally and ventrally over a field size of 10 × 15 to 15 × 15 cm. In a few cases sieve therapy of 1000 R was given. All patients received 4000 to 5000 R in all. Pneumonitis that appeared within 1 to 2 months and fibrosis that appeared within 4 to 6 months after irradiation were considered to result from the treatments. Two types of lung changes were observed. In one group of 12 patients a pneumonitic reaction was observed in the region of the tumor. Some of these patients had coughs. In the second group the most widespread roentgenologic criterion was extended involvement of healthy lung parenchyma, diffuse opacity of the lung field, possibly due to hyperemia or interstitial or interalveolar edema. Subsequently, the areas became diffusely shadowed, and then, in the indurative state, fibrotic. Later, the lung became shrunken, with bronchiectasis and emphysema. These complications make it difficult to differentiate later between a tumor recurrence and fibrosis. These patients generally had fever. Some were subjectively symptomless, but a few had coughs. The most frequent symptom was dyspnea. To prevent radiation fibrosis the fields irradiated should be restricted to the area of the tumor. This can be partially controlled by fluoroscopic survey and periodic x-ray photography. To prevent infections, antibiotics should be used. Steroids are helpful, but should not be used if tumor is stimulated by them. Respiratory exercises and drugs to improve ventilation are also useful. (BBB)

45515 DOSIMETRIC PROBLEMS IN THE COMBINED RADIUM AND TELECOBALT IRRADIATION. Frischbier, H.-J. (Univ.-Frauenklinik, Eppendorf, Ger.). Arch. Gynaekol., 202: 316-20(1964). (In German).

The importance of precise dosimetric determination in combined radium and telecobalt γ radiation is emphasized. Four possible means by which a homogeneous dose in the pelvic region can be measured are described and discussed. (J.S.R.)

45516 EXPERIENCES WITH PREOPERATIVE RADIOTHERAPY OF ESOPHAGEAL CANCER. Nakayama, K.; Yanagisawa, F.; Wagner, B. (Univ. of Chiba, Japan). Arch. Klin. Chir., 305: 94-107(Jan. 20, 1964). (In German).

A combination of preirradiation and prompt surgery has been shown to be superior to either alone in treatment of esophageal cancer. Effects of these treatments were studied in mice implanted with ascites hepatoma MH 134. Irradiation treatment consisted of 2000 R x radiation administered at a rate of 116 R/min at a focus-skin distance of 40 cm. This treatment was given either 4 days or 10 days after tumor implantation. The results showed no differences in animals suffering from an early stage of the tumor whether operated on or preirradiated before surgery. However, in animals with advanced tumors the survival rate was greatest if the combined treatment was administered. The authors have used a similar type of combined treatment for clinical patients with carcinomas of the esophagus, stomach, rectum, and with mammary carcinoma. Using short-term preirradiation, the survival rate in esophageal carcinoma was doubled as compared to surgery alone, and sixfold improved as compared to irradiation alone. In localized esophageal carcinoma the three-year cure rate was 100%. (BBB)

45517 BLOOD FLOW IN LIMBS DETERMINED WITH ^{131}I-HSA AFTER APPLICATION OF TOURNIQUETS TO DELIVER RADIATION UNDER ANOXIC CONDITIONS IN SARCOMATA OF THE EXTREMITIES. McCartney, R.; Kerr, R. C.; Cass, N. M.; van den Brenk, H. S. A. (Cancer Inst. Board, Melbourne). Austral. Radiol., 10: 240-2 (Aug. 1966).

Blood flow beyond a tourniquet applied to the thigh of human patients to produce circulatory arrest for the purposes of irradiation under tissue anoxia has been determined in two patients by means of radioiodinated human serum albumin ^{131}I-HSA. Significant blood flows past a tourniquet, but the amount appears insufficient to significantly increase tissue radiosensitivity in excess of that corresponding to near-anoxic values. The results stress the need for taking precautions to ensure adequate circulatory arrest and in promoting the consumption of oxygen by the tissues to be irradiated with high doses of x rays which would certainly result in normal tissue necrosis if relatively small amounts of extracellular oxygen were to remain in these tissues. (auth)

45518 PROTECTION PLANNING FOR DIAGNOSTIC X-RAY DEPARTMENTS: BASIC CONSIDERATIONS. Browne, E. J. (National Radiation Lab., Christchurch, N. Zeal.). Austral. Radiol., 10: 267-74(Aug. 1966).

Tables and attenuation curves represent the best available data for computing protective barriers. Their use will ensure that in normal circumstances the doses received by occupationally exposed workers and others in the vicinity will not exceed the permissible values. It must be emphasized, however, that the International Commission on Radiological Protection has strongly recommended that every effort be made to reduce exposures to all types of ionizing radiations to the lowest possible levels. Even with the best protective design for x-ray departments, radiation safety will still depend primarily upon the competence of the user

of the irradiating equipment and his continued efforts and interest in reducing all radiation hazards. (auth)

45519 GAMMA RADIATION THERAPY AND ITS USE IN THE TREATMENT OF CHRONIC, GRANULOMATOUS WOUNDS OF HORSES. **Dixon, R. T.; Larsen, L. H. (Univ. of Sydney). Austral. Vet. J., 41: 310-14(Oct. 1965).**

Techniques, doses, and precautions used to treat horses with Rn are presented. The cases described were treated first by conventional methods and then by 2000 R of γ radiation. Exuberant granulation tissue is hypersensitive to radiation, whereas the normal epithelium, the endothelium of blood vessels, and fibrocytes have an intermediate sensitivity. Provided that the dose of radiation is not too high, therefore, it is possible to inhibit the granulation tissue itself, while leaving the vascular supply, fibrocytes, and epithelial cells relatively intact. This means that there is no superficial layer of ischemic tissue and that the epithelium can grow over the granulations in a normal fashion. The more anaplastic the granulation tissue and the higher its mitotic rate, the more susceptible it is to radiation. Thus, chronic sinuses in granulation tissue, and infected granulation tissue will respond well to radiation therapy provided that there is no foreign body present. The use of γ radiation is hazardous, and recommendations are that the hands and forearms, feet and ankles should receive not more than 8000 mR in any 13 consecutive weeks. It is therefore necessary to wear lead rubber gloves and apron. The needles, seeds, or tubes containing Rn should be handled with long forceps, not fingers, using quick, deft movements. If handled with speed and efficiency, minimal permissable doses are not reached. To minimize unnecessary exposure to personnel and to other stock, the patient, while being irradiated, should be left in a stall away from other animals or where personnel are normally working. The importance of speed in handling and distance from the source are emphasized. The source used was monitored on the second day of treatment. At 16-ft distance from the source, the radiation level was 2.75 mR/hr, whereas at 7 ft the level had increased to 100 mR/hr. (BBB)

45520 RECENT RESEARCH ON TOTAL-BODY IRRADIATION AND BONE MARROW TRANSPLANTATION IN HUMANS. **Mathe, Georges; Amiel, Jean-Louis (Hopital Paul-Brousse, Villejuif, France). Biol. Med. (Paris), 54: 455-65(July-Aug. 1965). (In French).**

Three applications of bone marrow grafts are discussed, and practical problems in the transplantation of hematopoietic tissue are examined. The grafts can be used for replacement in myeloid insufficiency, for treatment of certain neoplastic processes in conjunction with whole-body irradiation, and for establishment of specific immunologic tolerance. Use of bone marrow grafts in 23 irradiated subjects is reported. Eight were in the terminal stages of leukemia and were given 200 to 400 rad, followed by allogenic marrow transfusion; five were subjects accidentally exposed to γ and neutron radiation; and 10 were leukemia subjects exposed to 800 rad of ^{60}Co radiation followed by allogenic marrow transfusions. Studies on the use of irradiation and marrow grafts in mouse leukemia are also dealt with. Problems in the use of marrow infusions are considered in terms of development of the secondary syndrome with nonisogenic marrow, optimal numbers of cells required for successful restoration of hematopoietic function, and use of multiple marrow donors. By using more than one donor it may be possible to ameliorate the secondary syndrome, the nature of which is discussed. (BBB)

45521 DEVELOPMENT OF LOWER GENITAL CARCINOMAS IN PATIENTS WITH ANAL CARCINOMA: A MORE THAN CASUAL RELATIONSHIP. **Cabrera, A.; Tsukada, Y.; Pickren, J. W.; Moore, R.; Bross, I. D. J. (Roswell Park Memorial Inst., Buffalo). Cancer, 19: 470-80(Apr. 1966).**

The possible carcinogenic role of radiotherapy and other therapeutic agents was investigated in a series of 64 cases of anal carcinomas in the female, 11 of which had multiple primaries in the anogenital tract. A more than casual association of these tumors is suggested. Radiotherapy for a carcinoma in one tissue may be carcinogenic to another tissue. In 5 patients with anal carcinoma the tumors were synchronous and no therapeutic agents can be incriminated since diagnoses of both tumors were made before any therapy was given. In 6 patients the tumors were metachronous. The time interval between the radiation treatment of the first tumor and the diagnosis of the second tumor in one of these cases is relatively short. It is unlikely that the ionizing radiation caused the second cancer. In 4 cases the lag period was longer than 5 yr, and ionizing radiation was used to treat the primary lesion. It was concluded that the ionizing radiation probably played a role in the development of the second carcinoma in those cases in which the lag period was longer than 5 years. (BBB)

45522 ON THE PROBLEM OF POSTOPERATIVE PROPHYLACTIC ISOTOPE THERAPY FOLLOWING CANCER SURGERY IN THE ABDOMEN WITH SPECIAL CONSIDERATION OF KINETICS AND DISTRIBUTION OF RADIOGOLD AND SILVER-PLATED RADIOGOLD. **Gibel, Wolfgang; Andrysek, Oskar; Altenbrunn, Hans-Juergen; Wildner, Gustav (Robert-Roessle-Klinik, Berlin). Chirurg, 36: 363-6(Aug. 1965). (In German).**

Concentrations of colloidal ^{198}Au, 30-50 mμ in size and Ag-plated colloidal ^{198}Au were measured in rats and guinea pigs for periods of up to 48 hr postadministration. They were injected intraperitoneally, intrapleurally, intramuscularly, subcutaneously, and intravenously. The colloidal ^{198}Au concentrations in the liver were greater than 85%, with about 1.5% in spleen. The Ag plated ^{198}Au was concentrated in the structures outside the liver, especially in the lymphatic tissue, while the colloidal ^{198}Au was mostly on the serous surfaces of the tissue. However, some colloidal ^{198}Au was found in the lymphatic tissue following subcutaneous injection. After intraperitoneal and intrapleural use the Ag-plated ^{198}Au was concentrated in the serous, mesenteric, paraaortic, and subclavicular lymph nodes. The behavior of the Ag-plated ^{198}Au indicated that it would be effective for irradiation of lymph nodes and vessels. There was no indication of injury when it was given intraperitoneally immediately after an abdominal operation. However, it should not be administered after radical surgery on the gastrointestinal tract until after drainage has ended. One disadvantage of use of Ag-plated ^{198}Au is its short effective irradiation range, so that it is primarily suitable for small metastases. However, this form of treatment should have more extensive testing of its therapeutic value. (BBB)

45523 DELINEATION OF ACTIVE MARROW BY WHOLE-BODY SCANNING WITH RADIOACTIVE COLLOIDS. **Kniseley, R. M.; Andrews, G. A.; Tanida, R.; Edwards, C. L.; Kyker, G. C. (Oak Ridge Inst. of Nuclear Studies, Tenn.). J. Nucl. Med., 7: 575-82(Aug. 1966).**

Instrumentation and test compounds used as tracers for delineation of functioning bone marrow are described, and clinical experience with 89 patients is summarized. Whole-body scans were made with a moving detector beneath the patient according to established principles of rectilinear area scanning following intravenous administration of colloidal ^{198}Au, ^{159}Gd hydroxycitrate, or ^{99m}Tc sulfur sol colloid. A single scan required about 80 min. The whole-body scanner provided a reasonably rapid and complete method for showing in a single view all functioning bone marrow, except that obscured by liver and spleen. Compared with area scans detail was sacrificed somewhat because of the less sharply focused collimation. Initial trials with ^{159}Gd hydroxycitrate showed that it clears from the blood less rapidly than colloidal gold, though scans yield a pattern resembling that obtained with ^{198}Au. Results with ^{99m}Tc indicated that for whole-body scanning, difficulties arise from scatter characteristics of the 140 kev emission. Success of the technique was analyzed in patients with acute and chronic leukemia, multiple myeloma, lymphoma, hemolytic anemia, polycythemia vera, and in patients with local marrow lesions. (H.G.D.)

45524 ^{57}Co LABELED VITAMIN B-12 PLASMA LEVELS FOR THE DIFFERENTIAL DIAGNOSIS OF MACROCYTIC ANEMIAS. Workman, Joseph B.; Rusche, Edward (Univ. of Maryland, Baltimore). J. Nucl. Med., 7: 583-8(Aug. 1966).

Plasma levels and urinary excretion were determined in normal individuals and pernicious anemia patients using ^{57}Co-labeled vitamin B_{12}. Both plasma levels and urinary excretion of radioactivity were lower in the pernicious anemia group. When Intrinsic Factor Concentrate was added, plasma levels remained significantly lower in the pernicious anemia group, but the per cent of administered dose appearing in the urine in 24 hrs rose to within normal range. It was concluded that significant separation of normal and anemic persons is possible using the 8 hr plasma sample as reference. Of the Co isotopes in general use, ^{57}Co delivers by far the smallest radiation dose to the liver and has the best counting efficiencies when standard hospital radioisotope equipment is used. (H.G.D.)

45525 SENSITIVITY OF BREMSSTRAHLUNG ACTIVATION ANALYSIS FOR IODINE DETERMINATION. Mulvey, Philip F. Jr.; Cardarelli, John A.; Zoukis, Mary; Cooper, Raymond D.; Burrows, Belton A. (Boston Veterans Administration Hospital. Boston Univ. Army Natick Labs., Boston). J. Nucl. Med., 7: 603-11(Aug. 1966).

The sensitivity of the $^{127}I(r,n)\,^{126}I$ reaction and the possible interference by contaminating elements in normal beef thyroid tissue and pooled human serum were evaluated. When trace quantities of ^{127}I were used, the conversion of ^{127}I to ^{126}I was carried out with no apparent interference from other primary reactions. There was a linear relation between KI concentration and the net cpm of ^{126}I in either water or saline standards. Irradiation of a 200 mg slice of calf-thyroid tissue and pooled human serum showed the two major ^{126}I r peaks, 0.386 Mev and 0.65 Mev. (H.G.D.)

45526 IN VIVO THYROID AUTORADIOGRAPHY. Raymond, Herman R.; Haig, Pierre V.; Kimball, William R. (Univ. of Southern California, Los Angeles. Los Angeles County Hospital, Los Angeles. Loma Linda Univ., Los Angeles). J. Nucl. Med., 7: 620-4(Aug. 1966).

Autoradiographic visualization of the thyroid in vivo with the use of ordinary x-ray grids for collimation of the low-energy γ radiation from ^{125}I is described. In autoradiography of a thyroid phantom, excellent resolution was achieved with a long exposure time, but even with reasonable exposure items, good resolution was possible. Improvements in speed, either with faster film, faster intensifying screens, or both, would reduce the exposure time sufficiently to make this type of autoradiography a practical, inexpensive method for visualization of radioactive organs. (H.G.D.)

45527 AMNIOTIC FLUID STUDIES BY ISOTOPE DILUTION AND SCANNING. Spencer, Richard P. (Yale Univ., New Haven); Fishbone, Gerald; Davis, Clarence D. J. Nucl. Med., 7: 629-32(Aug. 1966).

An initial approach to radioisotope scanning of the amniotic fluid space is presented. One ml of amniotic fluid was replaced with one ml of radioiodinated serum albumin in a pregnant sheep and in two pregnant women just prior to therapeutic abortion. Beta dose in rads to fluid was determined in vitro. Possible uses of the procedure are discussed. (H.G.D.)

45528 BRAIN SCANNING; NORMAL ANATOMY WITH ^{99m}Tc PERTECHNETATE. Mack, James F.; Webber, Milo M.; Bennett, Leslie R. J. Nucl. Med., 7: 633-40 (Aug. 1966).

The use of ^{99m}Tc in brain scanning has made it possible to visualize better anatomical details not seen quite as well using other scanning methods. The top or vertex view is discussed in addition to the conventional anterior, lateral, and posterior views. Vertex views were done with ^{197}Hg chlormerodrin, which had the advantage of permitting visualization of areas such as the nasal mucosa, parotid glands, and mouth regions that were obscured by concentrations of pertechnetate in ^{99m}Tc studies. (H.G.D.)

45529 RADIOACTIVE CHROMIC PHOSPHATE IN CYSTIC BRAIN TUMORS. Overton III, Marvin C. J. Nucl. Med., 7: 641-2(Aug. 1966).

Follow-up examinations were made on three patients who had received injections of ^{32}P-labeled chromic phosphate for cystic craniopharyngioma and other similar cystic brain tumors. Findings suggest justification for the further use of radioactive chromic phosphate in certain cystic tumors when surgery alone would not suffice. (H.G.D.)

45530 CLINICAL POSITION OF RENOGRAM AND RENOSCINTIGRAM IN THE RENAL FUNCTION TEST. Hisada, Kinichi; Kawanishi, Hiroshi (Kanazawa Univ., Japan). Jap. J. Nucl. Med., 1: No. 2, 98-103(Nov. 1964). (In Japanese).

The clinical position of renal functional and morphological tests by radioisotopes was compared with the conventional routine renal tests. In unilateral renal diseases such as renal calculus, tumors, tuberculosis, hydronephrosis, and unilateral arterial abnormality, the diagnostic results obtained by renogram, renoscintigram, and IVP, are almost the same (88 to 89%). In bilateral renal diseases such as renal hypertension and nephritis diagnosis by the three tests is less successful. (TSAT)

45531 SERUM PROTEIN CHANGES IN CERVIX CARCINOMA BEFORE AND DURING IRRADIATION. A CONTRIBUTION TO THE STUDY OF BODILY RESISTANCE. Graf, H. (Univ., Tuebingen, Ger.). Med. Welt, 35: 1956-62(Aug. 28, 1965); 2043-6(Sept. 4, 1965). (In German).

Before and during irradiation treatments of cervical carcinoma, total serum protein and the serum protein electrophoretic pattern were studied. Of 40 cases studied 5 were Stage I, 13 were in Stage II, and 8 were in Stage III. The remainder were in Stage III, with complications, such as hydronephrosis and pyelitis. Serum samples were taken before the start of irradiation and 1, 3, 5, 7, 14, 21, 28, and 35 days after. The irradiation treatment consisted of 3 intrauterine Ra applications of 1200 mg-hr each, 3 intravaginal Ra applications of 960 mg-hr each, and a total focal dose of 3200 to 3400 R x radiation given by convergent pendulum irradiation. In Stage I and III patients the albumin component was considerably decreased, but the α_2-globulin, β-globulin, and γ-globulin components were increased. These differences were greater in the Stage III patients. The plasma components varied considerably more, and in differing directions, in the Stage III patients with complications. In general, plasma dysproteinemia was characterized by decreased albumin and increased globulins, particularly the γ-globulin component. Sustained hypergamma-globinemia with a rapid rise toward the end of the irradiation usually indicates an unfavorable prognosis. (194 references). (BBB)

45532 SEVERE PSORIASIS COMPLICATING RADIOTHERAPY. Seydel, H. Gunter (Wayne State Univ., Detroit). Mich. Med., 64: 926-8(Dec. 1965).

To illustrate some problems involved in the use of radiation in the presence of skin diseases, a patient with carcinoma of the endometrium complicated by severe psoriasis in the treatment ports is presented. External cobalt therapy gave a dose to the pelvis 4880 rad in five weeks. Immediately after the cobalt-60 teletherapy, 25 mg of radium was placed in the uterine cavity for 120 hours. The skin dose at the treatment port was 1146 rad (40% of the max dose). The radium contribution was very small, the highest dose being 146 rad to the skin of the abdomen. The total calculated skin dose was 1711 rad for this patient. This skin dose was higher than that usually quoted for the treatment of psoriasis, especially considering the long protraction employed in the treatment of dermatological conditions. However, it is below the total dose employed with grenz rays delivered in a similar period of time. The fact that the skin within the treatment ports and the remaining skin involved with psoriasis showed no difference during and after radiother-

apy indicates that the changes in the skin were not due to the irradiation therapy. Improvement in the patient's skin condition was probably due to the topical medications which were given. In view of the possible surgical complications due to psoriasis, radiotherapy in adequate dose can be given to such patients if suitable supervoltage equipment is employed. The high skin dose delivered in the irradiation of the pelvis by orthovoltage radiation makes the use of this type of equipment inadvisable for patients with psoriasis on the skin of the treatment ports. (TCO)

45533 INTRACAVITARY AND EXPERIMENTAL DOSIMETRY DURING TELECOBALTOTHERAPY OF TUMORS OF THE UTERUS. **Macarini, N.; Besio, G. L.; Gandolfo, E. (Univ., Genoa). Minerva Med., 53: 1318-21(May 2, 1962). (In Italian).**

Some dosimetry data were obtained for the treatment of uterine cancers by ^{60}Co γ radiation. A water-filled phantom of the pelvis and ionization chambers were used. The average pelvic dimensions of the phantom used, which represented values taken from 100 women aged 18 to 65 yr, were 22.5 cm anteroposterior diameter and 33.5 cm lateral diameter. Measurements are given for both small field and wide field irradiation (4 × 10 and 8 × 10 cm, respectively). With the usual 13 treatment sessions used the anterior walls of the bladder and rectum receive a total dose of 1800 and 2200 R and the posterior walls 2300 and 2000 R. These doses were well tolerated and no serious radiation injuries were noted. (BBB)

45534 IRRADIATION OF PRESCALENE LYMPH NODE METASTASES OF BRONCHIAL NEOPLASMS BY MEANS OF RADIOACTIVE NITROGEN MUSTARD. **Georgacopulo, P.; Stancanelli, V.; Ferraris, R. (Univ., Ferrara, Italy). Minerva Med., 56: 1554-6(May 16, 1965). (In Italian).**

A possible new method for radiotherapy of metastatic cancer was investigated in three patients with inoperable bronchiogenic cancer. The method was based on the concept of introduction of a radioactive compound that would be transported to the lymph nodes bearing metastatic cancer after its introduction intrabronchially. Studies were conducted with ^{35}S-labeled triethylenethiophosphoramide (thioTEPA). A solution of 17 mg of thioTEPA with a sp act. of 0.96 mC/ml was obtained. The solution was instilled into the bronchi of three patients and lymph nodes were biopsied 30 min later. Autoradiography of the prescalene lymph nodes demonstrated radioactivity in the periphery of the lymph follicles. The results show that the radioactive cytostatic agent is transported from the bronchi to the draining lymph nodes where it can act on metastatic cancer cells. (BBB)

45535 TREATMENT OF POSTOPERATIVE PAROTITIS. **Buttenberg, D. (Univ.-Frauenklinik, Heidelberg). Muenchen. Med. Wochschr., 106: 308-9(Feb. 14, 1964). (In German).**

A total of 88 cases of postoperative parotitis was treated between 1947 and 1963 with x irradiation or telecobalt irradiation. Two doses of 50 R each were given on consecutive days to all but 23 of the patients. With the exception of 4 patients who required incision after this treatment, the pain and tissue inflammation subsided within hours after the first irradiation. At the latest the swelling disappeared within 3 days after the second irradiation. Telecobalt irradiation was administered in two 50-R doses 24 hr apart to 23 of the patients. The advantages of this treatment were that the size of the irradiation field could be adjusted more directly to the size of the inflamed area, and also there was no scattered radiation. The volume dose at small focus-skin distances is not greater than with conventional x irradiation. Incision and drainage is unnecessary, especially since it involves a risk of greater mortality. If an abscess forms because of secondary infection, an incision can still be carried out without any greater possibility of complications because of the previous radiotherapy. (BBB)

45536 THE USE OF ^{99m}Tc PERTECHNETATE IN THE SCINTIGRAPHIC EXAMINATION OF THE THYROID (PRELIMINARY COMMUNICATION). Krasznai, Istvan; Pal, Imre; Foldes, Janos (Univ. of Budapest. National Atomic Energy Committee, Budapest). Orv. Hetilap, 107: 112-13 (Jan. 1966). (In Hungarian).

The initial experiences with the use of ^{99m}Tc isotope for the scintigraphic examination of the thyroid are reported. The ^{99m}Tc isotope is selectively absorbed by the thyroid similarly to the iodide ions; ^{99m}Tc can thus be used for the scintigraphic presentation of the thyroid. Because of its favorable physical properties (short half-life, lack of corpuscular radiation), the radiation dose received by the patient because of the examination is greatly reduced with the use of ^{99m}Tc. (JPRS)

45537 TREATMENT OF THE RETICULOSES. **Mathias, J. Q. (Royal Marsden Hospital, London). Practitioner, 196: 96-103(Jan. 1966).**

Use of radiation to treat Hodgkin's disease, lymphosarcoma, reticulum-cell sarcoma, and myeloma is reviewed. In cases with solitary plasmacytoma in an accessible situation, resection should be followed by local irradiation. Both stage I and stage II disease are suitable for curative, as opposed to palliative, radiotherapy. A large dose is given to the sites known to be involved and smaller, prophylactic doses are directed to associated lymph nodes groups. Some therapists irradiate all intervening tissue. As more tissue is irradiated, treatment becomes more protracted and causes greater general disturbance, and eventually is limited by marrow depression and the risk of causing irreversible damage to normal tissue. The results of such treatment is excellent. In disseminated disease, radiotherapy remains the most efficient way of reducing the size of a localized tumor, and should be administered in doses sufficient to induce symptomatic relief. As cure is not possible and further courses will be required, there is little point in reducing the marrow reserve by using unnecessarily large doses. Radioisotopes may also be used. Radiophosphorus is selectively concentrated in bones and benefits some patients with myelomatosis. Radiogold may be given intrapleurally in the treatment of recurrent malignant effusions, and radioiodine and radiogold may be introduced directly into the afferent lymphatics of involved nodes. (BBB)

45538 RADIOISOTOPES IN MEDICINE: AVAILABLE RADIOISOTOPES, SCANNERS, AND CAMERAS. **Fowler, J. F. (Postgraduate Medical School, London). Proc. Roy. Soc. Med., 59: 439-42(May 1966).**

Physical aspects of γ scanning are reviewed with emphasis on recent developments in instrumentation and use of small doses of short half-life isotopes which reduce patient exposure. Conventional scanners may take 30 to 45 min to scan a brain or a liver in one plane, unless a very short-lived isotope such as technetium-99m (6-hr half life), iodine-123 (13 hr), or fluorine-18 (2 hr) is used, when the time might be reduced to 10 to 15 min. Long scanning times can be avoided with the gamma camera, a large stationary detector, which can look at an equal area in the patient continuously, without moving. A positron version of the camera is now available. It has a smaller variation of resolution with depth, and good resolution and sensitivity, but will not be able to deal with high counting rates. An even greater advantage of camera detectors arises from the short exposure times. The combination of cameras and very short-lived isotopes should open new possibilities, such as the detection of cardiac infarcts with cyclotron-produced ^{130}Cs. Serial brain scans have been taken with 10 to 30 sec frame times using ^{99m}Tc. Kidney scans with 2-min frame times have been taken with ^{197}Hg and the frame times should be only 10 to 20 sec with ^{123}I-Hippuran, using the cyclotron-produced isotope ^{123}I which has no β emission. The physical reasons for preferring some isotopes are that the radiation dose to the patient is minimized and the number of counts detected is maximized if the isotope has a short half life and no β-ray (or positron) emission. Further, γ rays of energy above about 0.4 Mev penetrate too readily through the collimator walls and septa and spoil the resolution. Gamma rays of energy below about 0.1 Mev are attenuated (and scattered) too much in tissue; so the optimum γ-ray energy for scanning is about 0.1 to

0.2 Mev. Some examples of isotopes available for kidney, liver, and brain scanning are given. (BBB)

45539 THROMBOPENIC SYNDROME FOLLOWED BY ACUTE LEUKEMIA. CONSIDERATIONS ON A CASE. **Mancini, L.; Beni, G.; Papa, G. (Univ., Rome). Progr. Med., 20: 391-3(June 30, 1964). (In Italian).**

A case history is presented which possibly implicates treatment with ionizing radiation in the causation of leukemia. A 58-yr-old man developed acute leukemia six years after radiotherapy for a hemorrhagic diathesis resulting from thrombocytopenia. In 1957 the patient had experienced repeated nosebleeds, and it was found that his blood platelet level was low (25,000 per mm^3). Cutaneous and mucosal hemorrhagic signs were also evident, as was enlargement of the spleen. A series of x-radiation treatments was directed at the spleen to give a total dose of 800 R. This resulted in remission of the hemorrhagic syndrome. In 1963, his hemorrhagic phenomena reappeared, with enlargement of the liver and spleen. Platelet level was low (20,000 per mm^3). Leukemia was diagnosed from bone marrow biopsy at this time; it proved to be rapidly fatal. The possibility that the leukemia may have been associated with a hematopoietic disorder reflected by thrombocytopenia or that it may have been induced by radiotherapy is considered. The radiation dose used in this case (800 R) is within the range which has been shown to induce leukemia experimentally and clinically. However, it is not possible to state unequivocally that radioinduction of leukemia did occur in this case. (BBB)

45540 CONTRIBUTION TO THE STUDY OF INDIRECT EFFECTS OF ROENTGEN THERAPY. **Cimellaro, M. (Univ., Rome). Quad. Clin. Ostet. Ginecol., 19: 571-80(Oct. 1964). (In Italian).**

In 200 patients undergoing x-ray therapy for uterine cancer, evidence was sought of the indirect, systemic effects of irradiation. Total and differential leukocyte counts in peripheral blood were made at intervals up to 72 hr post-irradiation. Grid (1.5 × 1.5 cm apertures) x-ray therapy was given over a 350-cm^2 pelvic field for doses of 400 R on alternate days for a total of 12,000 R in 35 to 40 days. Patients were treated with vitamin B_6 during radiotherapy, and bladder and rectum changes were followed regularly by cystoscopy and rectosigmoidoscopy. These examinations revealed diffuse hyperemia and diffuse teleangectasia of the mucosa in both sites. Episodes of hematuria were frequent, and some patients showed transient tachycardia. These disturbances were generally correlated with a diminution in the number of circulating leukocytes, and it is suggested that a sharp fall in leukocytes is an indication for interrupting radiotherapy. Leukopenia of a severe degree (<3000/mm^3) was noted in 27 cases (13.5%). In cases studied intensively an immediate drop in circulating polymorphonuclear leukocytes was seen, that is, 15 to 20 min after exposure to x rays. After this initial drop, there was a tendency in the next hours for the polymorphonuclear leukocyte count to rise again. Then it followed a slow progressive decline. These changes may reflect radioinduced depression of DNA synthesis in blast cells. (BBB)

45541 CONSIDERATION OF THE NECROTIZING EFFECT OF TELECOBALT THERAPY ON PULMONARY NEOPLASIA. **Alcozer, G.; Besio, G.; Falchi, Q. (Univ., Genoa). Quad. Radiol., 29: 523-54(Sept.-Oct. 1964). (In Italian).**

A survey was made of 708 cases of lung cancer treated by telecobalt γ radiation to ascertain the incidence of necrotizing processes which caused cavity formation in the lung and to study the development and course of these processes when they occurred. Only two such cases, giving an incidence of 0.28%, could be detected. Only one was detected radiographically, the other being surmised from clinical data. In the first case, a 72-yr-old man received 35 ^{60}Co irradiations over a 10 × 10 cm field to give a total focal dose of 7000 R. Three days after the last treatment he developed hemothorax, and died 19 days later as his condition progressively deteriorated. In the second case, that of a 62-yr-old man, pulmonary irradiation had to be terminated after 20 irradiations of 200 R each (total dose 4000 R) because of a febrile reaction and mucopurulent sputum. No pulmonary cavitation could be detected in this case. A second cycle of irradiation was given and the patient died, 13 months after initiation of irradiation. Only in the first case could the volume of the lung cavity be observed to expand. It is concluded that cavitation of the lung is a rare sequelae of pulmonary irradiation at the doses used. In cases in which it occurred, whether it was caused by irradiation directly or secondarily by the inflammatory reaction, could not be ascertained. (BBB)

45542 LUNG FIBROSIS AFTER X IRRADIATION: RADIOLOGY, CLINICAL STUDIES AND RESEARCH ON ITS PATHOMORPHOGENESIS. **Baessler, R.; Buchwald, W. (Univ., Mainz). Radiologe, 6: 95-103(Mar. 1966).**

The intensity of radioinduced exudative and fibrotic lung tissue reactions is proportional to the absolute value of the irradiation dose. In tangential irradiation of mammary cancer the incidence of lung changes varies between 2 and 40%, and with stationary field irradiation of lung tumors, malignant granulomas, and esophageal carcinomas it varies between 20 and 80%. In the exudative stage of pulmonary radiation injury symptoms may include cough, dyspnea, and fever which may differ considerably with the size of the irradiated lung volume, the dose used, the functional state of nonirradiated lung tissue, and circulatory status. Frequently, lung function diagnosis may reveal the effects of irradiation, although other symptoms may be absent. The prognosis for radioinduced lung changes is good as long as there are no other lung diseases associated with them. Severe radiation pneumonitis with radioinduced lung changes may be fatal. Generally, there is little correlation between irradiation injuries and ventilation disturbances. Pulmonary reactions to irradiation do not respond to corticosteroids. Actinomycin D has a relatively good protective effect. The only really effective measure is prevention of exposure of healthy lung tissue to irradiation, as much as possible. References cited, 58. (BBB)

45543 RELATIVE BIOLOGICAL EFFECTIVENESS OF HIGH-ENERGY PHOTONS AND ELECTRONS COMPARED WITH CONVENTIONAL X RAYS IN CLINICAL ASPECTS. **Bohndorf, W. (Univ., Wuerzburg, Ger.). Radiologe, 6: 103-10(Mar. 1966). (In German).**

The author discusses the basis for relative biological effectiveness values established in clinical radiobiology for skin and deep-lying tissues. Dose effects of x irradiation are compared with those of ^{60}Co irradiation for various organs and tissues of humans and experimental animals. Relative biological effectiveness for these types of radiation in tumor tissue is reviewed and discussed. Studies of the last decades have demonstrated that there are definite quantitative and qualitative effects of high-energy photons and electrons as compared to conventional x rays. The superiority of energetic radiations compared to x radiation is primarily due to physical factors. Among these is the great facility with which the dose distribution can be better adapted to the pathological-anatomical status of the tissues that are to be irradiated. The relative biological effectiveness of high-energy electrons ranges, in general, from 0.5 to 1 in its tissue effects, as compared to x irradiation. (81 references.) (BBB)

45544 EXPERIENCE IN THE DIAGNOSIS AND TREATMENT OF HOT NODES OF THE THYROID GLAND WITH RADIOACTIVE IODINE. **Burliev, B.; Nikolov, P.; Yshev, Iv. (Higher Medical Inst., Sofia). Rentgenol. Radiol., 3: No. 4, 23-9(1964). (In Bulgarian).**

Experience in the diagnosis and treatment of thyrotoxic adenoma with ^{131}I is reported. The disease, which has a typical scintigraphic image, was observed in 68 out of 937 scintigraphic tests or 7.1% of all neoplasms of the gland. This is explained by the fact that prior to the introduction of scintigraphy, the bloodless method of examination was impossible and therefore the disease was considered a rare one. A very good therapeutic effect is obtained by treating the hot nodes with radioactive iodine, employing

surgical intervention in cases where radioactive iodine-resection is indicated. (JPRS)

45545 DIAGNOSIS OF OCCUPATIONAL RADIATION IMPAIRMENT OF HEMATOPOIESIS. Mitrov, G. G.; Zografov, D. G. Rentgenol. Radiol., 3: No. 4, 47-52 (1964). (In Bulgarian).

The results of a study of the hemograms of individuals working in a sphere of ionizing radiations are reported statistically and dynamically. The importance of pathological changes in the diagnosis of impairment of hematopoiesis on account of occupational exposure to radiation are discussed. Practical conclusions regarding their correct interpretation are presented. (JPRS)

45546 HYPOPHYSIAL AND OVARIAN RADIOTHERAPY IN WOMEN. Caballero, A.; Hurtado, E. (Instituto Provincial de Ginecologia y Obstetrica, Madrid). Rev. Franc. Gynecol. Obstet., 58: 289-312(Apr. 1963). (In French).

The use of x ray treatment of the pituitary and the ovaries for sterility in 114 women is described, with data on the complications and an assessment of the genetic hazards. Anovulatory cycles were present in 87 and cycles with luteinic insufficiency in 27 of the women treated. In all cases, both the pituitary and ovaries were irradiated, simultaneously in 91 cases and successively (with an interval of 4 to 11 months) in 23. The hypophysis was given 72 R of 180-kv x rays and the ovaries 40 R each. In 4 cases the treatment was repeated. Ovulatory cycles were restored in 65% of the cases and normal luteal function in 38%. Pregnancies resulted in 18 cases. Four women complained of breast pain and three of headaches. In two cases, irradiation induced premature menopause; in one case this occurred three months after irradiation and after 11 months in the other. This is a possible complication in all women aged 35 or over. The abortion rate was high (17.8%) among women who did conceive. Objections to the treatment from a genetic standpoint are answered, and it is concluded that such irradiation is justified in selected cases when other therapy for sterility has failed. (BBB)

45547 COMBINED SEQUENTIAL RADIOTHERAPY AND SURGERY IN THE MANAGEMENT OF MALIGNANCIES. Glicksman, Arvin S. (Memorial Hospital for Cancer and Allied Diseases, New York). Rhode Island Med. J., 48: 538-43(Oct. 1965).

The possibility that the combination of radiotherapy and surgery may offer significant improvement in survival is evaluated. The advantages and disadvantages of radiotherapy prior to surgery are listed. When the delivered dose and the time for surgery are judiciously chosen, complications are minimal. Use of full-dose and moderate-dose preoperative irradiation is reviewed, with comments on complications which have been noted in treating various kinds of cancer. Interstitial radioisotope implantation at the time of surgery has the advantage that it can give a higher tumor dose with a smaller dose to the surrounding normal tissue than with external radiation. It is concluded that sufficient experience has accumulated in the last quarter century to indicate that the judicious association of radiation and surgery can improve ability to cure and control cancer. (TSS)

45548 ^{131}I TREATMENT OF HYPERTHYROIDISM: ANALYSIS OF 348 CASES TREATED WITH THE INITIAL DOSE OF 7 mC OR LESS. Yang, Hsueh-Fang (National Taiwan Univ. Hospital, China). Tai-Wan I Hsueh Hui Tsa Chih, 63: 234-45(May 28, 1964).

Problems in calculation of the ^{131}I thyroid dose are discussed relative to the treatment of a large number of cases, and development of myxedema as a late complication of radioiodine therapy is reported. An amount of ^{131}I should be given which is sufficient on the basis of thyroid weight and the elimination from and decay of the isotope in the thyroid to deliver a predetermined dose of radiation expressed in rad (6000 to 10,000) to the gland. The dose may be determined from the weight of the thyroid gland and by the uptake of the isotope by the gland as well; a dose of ^{131}I of 60 to 120 μC should be retained per g of thyroid. Two factors make the selection of appropriate dose of ^{131}I so difficult; one is inaccuracy in the estimation of the weight of the thyroid gland, and the other is unpredictability of the individual sensitivity of the thyroid to the irradiation. The dose was calculated to give a retention of 100 μC of ^{131}I for each gram of the thyroid gland, and if the calculated dose was below 7 mC, the calculated dose was given; if the calculated dose exceeded 7 mC, the dose was limited to 7 mC. There were 88 patients given a calculated dose below 7 mC, ranging from 2.6 to 6.9 mC; the average was 5.13 mC. In this group the cure rate after single dose administration was 56.5%, and 4.2% developed myxedema later. In 260 cases, the individually calculated dose exceeded 7 mC and a fixed dose of 7 mC was given. Their calculated doses ranged from 7 to 40 mC; the average was 10.9 mC. In this group the cure rate after single dose administration was 34.6%; 4.7% became myxedematous later, and 65.4% needed additional ^{131}I. This suggests that the sensitivity of each patient's thyroid to radioiodine varies widely. (BBB)

45549 LA GREFFE DES CELLULES HEMATOPOIETIQUES ALLOGENIQUES, PARIS, 7–9 SEPTEMBRE 1964. (Graft of Allogenic Hematopoietic Cells, Paris, Sept. 7–9, 1964). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 1-480(1965). (CONF-717).

Separate abstracts were prepared on 14 papers. Abstracts were previously prepared on 17 papers which appeared in NSA Vol. 18 as numbers 14316 and 43226 and in Vol. 19 as numbers 2079; 15217; 15218; 19468; 19493; 19615; 19617; 19644; 19646; 19647; 19648; 19651; 10652; 19653; and 24226. (C.H.)

For abstracts of individual papers see: 45251, 45479–45488, and 45550–45552.

45550 APPLICATION OF THE GRAFT-VERSUS-HOST REACTION TO THE TREATMENT OF LEUKEMIAS. Mathe, G.; Amiel, J. L.; Schwarzenberg, L.; Schneider, M.; Cattan, A. (Hopital Paul Brousse, Villejuif, France. Institut Gustave Roussy, Villejuif, France). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 445-52(1965). (In French).

Suppose a subject (A) is carrier of leukemic cells (a), the leukemia being eventually caused by a virus (α): total irradiation at a lethal dose destroys a high percentage of the leukemic cells and conditions the host by a bone marrow graft from subject (B). The myeloid cells of the latter restore the myeloid tissue, and the lymphoid cells the lymphoid tissue: furthermore, the latter react against the leukemic cells (a) that have resisted against irradiation, which they can eradicate. This was demonstrated by 3 experiments on mice, 2 involved the grafting of leukemia L 1210, and the third the spontaneous leukemia AkR. The lumphoid cells of the graft are still able to react against the virus (α), and this reaction has, on the one hand, an antileukemic effect, and on the other, may eradicate the virus from the blood stream or decrease its concentration. This is illustrated by two experiments on mice, using the leukemia induced by the Charlotte Friend virus. One can hope that if the virus is specific of strain or individually, it may not be capable of inducing a leukemia (b) in a subject that has become hematopoietically (B); in order to do so the graft would have to be 100% efficient and be permanent. In Man, 2 types of results were obtained: two transitory grafts, which produced survival of 1 year and 9 months, and one total, myelo-lymphoid graft, in a patient who, at the time of this therapeutic attempt, was resistant to all classical types of treatment and who has remained since then (i.e., April 1963) in perfect hematological condition. (auth)

45551 TEST OF TREATMENT OF DOG LYMPHOSARCOMAS BY HEMATOPOIETIC GRAFTS. Moldovanu, G.; Friedman, M.; Miller, D. G. (Sloan-Kettering Inst. for Cancer Research, New York). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 453-62(1965). (In French).

Destruction of the lymphoid tissue is a characteristic pathological feature of the graft versus host reaction. If

this could be accomplished in an animal with malignant lymphomas a beneficial effect on the disease might ensue. While radiation alone cannot eradicate leukemia in the living host it was of interest to determine if radiation plus graft versus host reaction could accomplish this in a large animal, using large quantities of transplanted homologous lymphoid cells. The conditions for this type of experiment are to be found in canine lymphosarcoma. This form of spontaneous cancer involves all palpable lymph nodes, the spleen, and invades the bone marrow. It spreads into all major organs and usually kills the animal in a few weeks from the time of diagnosis. In the studies presented here, 35 dogs were treated as follows: irradiated at 200 or 360 R x radiation; splenectomized; spleen suspension from normal donors; irradiated at 200 or 360 R and given spleen suspension from normal donors; splenectomized and given spleen suspension from immunized donors; splenectomized, irradiated at 270, 360, and 500 R and given spleen suspension from immunized donors; splenectomized, treated with chemotherapeutic agents and given spleen suspension from immunized donors; or splenectomized, irradiated at 900 R and given homologous bone marrow. Although one long survival was achieved, all animals died eventually of widespread disease. The use of immunological competent cells from immunized donors did not prove to be more beneficial than spleen suspensions from non-immunized donors nor did it produce a graft versus host reaction. The last group of dogs treated with lethal total-body irradiation and bone marrow from multiple donors failed to show a graft take, and all animals died of acute radiation effects despite administration of large numbers of hematopoietic cells. A treatment designed to challenge malignant lymphoid cells with immunological competent cells did not bring a cure of canine lymphosarcama or a consistently longer survival although temporary clinical improvement did occur. However none of the animals clearly developed a graft versus host reaction. If this can be produced it may yet prove to have a role in the management of this disease. (auth)

45552 ADDITIVE INHIBITORY EFFECT OF SUBLETHAL X RADIATION PLUS ALLOGENEIC LYMPHOID CELLS ON TRANSPLANTED MOUSE LEUKEMIA. Rering, Clifford H.; Cole, Leonard J. (Naval Radiological Defense Lab., San Francisco). Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 463-9(1965).

A limited graft-versus-host immunological reaction was used in conjunction with whole-body sublethal x irradiation of the host, as a means of inhibiting or suppressing the in vivo growth of a transplanted mouse leukemia. Adult LAF_1 mice were injected with various numbers of cells from a spontaneous LAF_1 lymphatic leukemia. At 5 days or 14 days after inoculation, the recipient mice received a single whole-body, sublethal x ray exposure of 500 rad, followed by an injection of 20×10^6 allogeneic spleen cells (from normal adult C3H mice). Survival time was significantly longer in the leukemic cell-injected mice which had received 500 rad plus allogeneic spleen cells, as compared with control mice x irradiated only; the mean survival time was more than tripled over the irradiated controls when the leukemia cell inoculum was small (1.6×10^6 cells). In one experiment, recipient mice received a leukemia cell inoculum of 34,000 cells followed by 500 rad, then an injection of 30×10^6 normal allogeneic spleen cells. They were then subjected to smaller doses of x rays (50 to 75 rad) given twice weekly for 10 or 11 weeks. Under these conditions, the majority of mice thus treated survived 6 months, while the controls were all dead by 10 weeks. It is concluded that the in vivo growth and competence of isogenic transplanted leukemic cells in mice can be significantly altered and controlled by combined therapy, involving sublethal whole-body x irradiation, together with transplantation of normal allogeneic immunologically competent cells. (auth)

45553 DEUTSCHER ROENTGENKONGRESS 1965. BERICHT UEBER DIE 46. TAGUNG DER DEUTSCHEN ROENTGENGESELLSCHAFT VOM 29. APRIL BIS 2. MAI 1965 IN NUERNBERG. TEIL B. STRAHLENBEHANDLUNG UND STRAHLENBIOLOGIE. (German X-ray Conference, 1965. Part B. Radiation Treatment and Radiobiology. Report on the 46th Session of the German X-ray Society. April 29–May 2, 1965, Nuernberg). Kuttig, H. (ed.). Strahlentherapie, Sonderbaende, 62: 1-307(1966). (CONF-650454).

The 39 papers and the discussions following each paper are compiled. Individual abstracts were prepared for 33 papers. (J.S.R.)

For abstracts of individual chapters see: 45440–45450, 45494–45499, 45554–45567, 46091, and 46092.

45554 INDICATIONS AND RESULTS OF THERAPY WITH FAST ELECTRONS IN THE CERVICAL, NOSE, AND EAR REGION. Kaercher, Karl Heinz (Univ., Heidelberg). Strahlentherapie, Sonderbaende, 62: 1-5(1966). (In German).

The indications for fast electrons in tumors in the throat, nose, and ear region, the principal irradiation techniques, and the results obtained are reported. The advantages of fast electrons in the energy range from 6 to 15 Mev with respect to other types of radiation are indicated. (tr-auth)

45555 ORIGIN, FREQUENCY, AND PROPHYLAXIS OF OSTEORADIONECROSIS OF THE LOWER JAW. Hess, Friedhelm (Univ., Marburg, Ger.). Strahlentherapie, Sonderbaende, 62: 6-9(1966). (In German).

The origin, frequency, and prophylaxis of osteonecrosis induced in the lower jaw by radiotherapy of tumors of the oral cavity and head are reviewed on the basis of previous studies. Latent bone necrosis must be watched for in all irradiations of the head. The precautions that can be taken to reduce the rate of osteoradionecrosis are summarized. The surgical repair of radioosteomyelitis is considered. (J.S.R.)

45556 RADIOTHERAPY OF HEAD AND NECK TUMORS. Tachiiri, Hiromu (Osaka Univ.). Strahlentherapie, Sonderbaende, 62: 17-24(1966). (In German)

The treatment of tumors of the head and neck performed at the University Clinic of Osaka is described. Upper jaw carcinomas were generally treated with total head doses of 7000 to 8000 R and could be radially removed within 4 to 6 weeks after the end of the irradiation. The results obtained with conventional irradiation and ^{60}Co were reported in detail, and three-year survival rates of over 50% were obtained with combined methods. The method of determining the optimum radiation dose and optimum size of the irradiated volume as a function of the tumor size was described for tongue carcinomas, which were treated generally by the interstitial method. It was shown that with doses of 7000 to 9000 R, which covered a volume approximately 10 times larger than the tumor, radionecroses and relapses could be reduced. (tr-auth)

45557 RESULTS FROM THE ELECTRON IRRADIATION OF MALIGNANT TUMORS OF HEAD-NECK REGION. Bauer, Robert; Schoen, Detlev (Univ., Tuebingen, Ger.). Strahlentherapie, Sonderbaende, 62: 25-43(1966). (In German).

A bibliographic review is given of the results obtained in the electron irradiation of malignant tumors. 339 references. (J.S.R.)

45558 RESULTS OF THE RADIATION TREATMENT OF THYROID CANCERS. Feine, Ulrich; Manolakis, Panagiottis (Univ., Tuebingen, Ger.). Strahlentherapie, Sonderbaende, 62: 50-6(1966). (In German).

The results of the radiation treatment of 181 patients with malign struma were reported. The results obtained with conventional x-ray therapy were compared with the results obtained with photon megavolt therapy (^{60}Co and 17-Mev betatron), fast electrons, and triiodothyronine therapy. The histological and functional differentiation is the determinant for the prognosis of struma maligna. On the basis of the histological and functional differentiation, four prognosis groups must be formed. Therapeutic results can be compared only within these prognostic groups. The megavolt therapy can yield more favorable results only with fast electrons in the dose range considered, but can not be sta-

tistically assured. A supplementary therapy with triiodothyronine appears to lengthen the survival time. (tr-auth)

45559 RESULTS FROM THE TREATMENT OF MALIGNANT TUMORS IN THE HEAD AND NECK REGION WITH THE BETATRON. Leroux, G. F., Minet, P.; Chevalier, Ph.; Garsou, J. (Univ., Liege). Strahlentherapie, Sonderbaende, 62: 57-61(1966). (In German).

The results obtained in the radiation treatment of malignant tumors in 70 patients were reported. The patients were divided into those with primary tumors and those with relapses. All tumors were irradiated with fast electrons, and the various irradiation methods used are summarized. The survival time and tumor recurrence were reported. (J.S.R.)

45560 RESULTS OF HIGH-VOLTAGE IRRADIATION OF BRAIN TUMORS WITH SIMULTANEOUS MEDICATION TREATMENT IN COMPARISON WITH CONVENTIONAL RADIOTHERAPY. Gerhardt, Paul; Schwamborn, Gerhard (Univ., Tuebingen, Ger.). Strahlentherapie, Sonderbaende, 62: 62-7(1966). (In German).

High-voltage irradiation treatment of brain tumors with simultaneous medication was compared with conventional radiotherapy on the basis of survival times. The results showed that the megavolt therapy combined with medication does not lengthen the survival time of the patients. 74 references. (J.S.R.)

45561 LIMITS AND POSSIBILITIES OF THE RADIOTHERAPY OF MALIGNANT TUMORS (RESULTS ON APPROXIMATELY 650 PATIENTS). Gregl, Anton (Univ., Goettingen, Ger.). Strahlentherapie, Sonderbaende, 62: 88-102(1966). (In German).

A combined radiotherapy-surgical treatment of the oral cavity tumors was used preferentially at the Radiotherapy Division of the Gottingen Surgical University Clinic. Control of the primary tumor in the oral cavity region can be effected both by radiotherapy and surgery. A total dose of 6000 to 8000 R was applied to the primary tumor. This dose was administered by radium picking or telecobalt. After control of the primary tumor, a prophylactic neck dissection was made following the Duffy principle. The results were reported for 650 oral cavity carcinomas treated from 1942 to 1963. The important complication after such radiotherapy is osteoradionecrosis. It generally begins with a mucous membrane ulceration, and sometimes also with external skin fistulas. The problems of the radiogenic osteonecrosis of the lower jaw were illustrated with two very instructive examples. (tr-auth)

45562 RADIOTHERAPY IN TUMOR DESTRUCTIONS OF THE SKULL BASE AND THEIR TREATMENT RESULTS. Schuster, Reinhold (Univ., Goettingen, Ger.). Strahlentherapie, Sonderbaende, 62: 103-14(1966). (In German).

On the basis of the observation of 91 patients, the frequency of tumor destructions of the skull base, its treatment results, and prognosis are reported. Of 273 malignant tumors of the nasal-pharynx region and of 79 parotid tumors, 55 (20.1%) and 17 (21.5%), respectively, led to a skull base involvement. In 6 patients, distant metastases and in 13 patients malignant primary tumors in the area of the skull base were found. A significant improvement was observed one year after the initiation of treatment in 34 (37.4%) of the patients. 43 (47.3%) still remained alive after one year and 17 (19.8%) after 3 years. The importance of radiotherapy in tumor-induced trigeminal neuralgia (in 51.6% of the patients) was indicated. (tr-auth)

45563 HIGH-VOLTAGE IRRADIATION OF EXTENSIVE UPPER JAW AND ORBITAL TUMORS WITH ^{60}Co USING A FILM-DOSIMETRIC METHOD. Loehr, Eberhard; Kunitsch, Gottlieb; Hagemann, Gerd (Univ., Marburg, Ger.). Strahlentherapie, Sonderbaende, 62: 115-20(1966). (In German).

In extensive orbital and upper jaw tumors, sufficiently homogeneous focal doses up to the sphenoid sinus can be obtained when the doubled dose is given by two fields from the ventral side rather than the temporal side. The burden of the healthy eyes is 10% at a maximum. The surface dose measured in the nasal-orbital angle corresponds to the mean focal dose. The simple method makes possible a reproducible application in practice. If operations occur, the operation defect must be filled up with a tissue-like medium (water). For the determination of the ion distribution, the dosimetric film Microtest-2 (Adox) was used in the plexiglass phantom and in the skull phantom. Deviations of less than ±5%, whose origins are discussed, occur. (tr-auth)

45564 SIMPLE AND UNIVERSAL SCHEME FOR DOSE CONTROL IN RADIOTHERAPY (PROGRAMMED DOSE CONTROL IN SINGLE FIELD IRRADIATION). Wichmann, Heinz (Mueller GmbH, Hamburg). Strahlentherapie, Sonderbaende, 62: 133-7(1966). (In German).

The deep dose curve measured in water is used as a purely physical half value width for the calculation of the dose at various tissue depths. An illustration is given of the calculation. (J.S.R.)

45565 FORMULATION OF IRRADIATION PLANS FOR ^{60}Co TELETHERAPY WITH DATA PROCESSING INSTALLATIONS. Schoknecht, Guenter (Auguste-Viktoria-Krankenhauses, Berlin). Strahlentherapie, Sonderbaende, 62: 143-8(1966). (In German).

The formulation of an irradiation plan for ^{60}Co teletherapy using a data processing installation was illustrated. Tissue attenuation factors and dose distribution were determined. (J.S.R.)

45566 CRITICAL CONSIDERATIONS OF THE USUAL INSTANTANEOUS MEASUREMENT FOR THE EVALUATION OF THE INTESTINAL BURDEN IN RADIUM IMPLANTS. Kapp-Schwoerer, Hermann; Pychlau, Peter (Univ., Freiburg i. B.). Strahlentherapie, Sonderbaende, 62: 149-54(1966). (In German).

The instantaneous dosimeter and the condenser chamber for the measurement of the intestinal burden with Ra implants were compared. Studies were first made on a water phantom and then on patients over a period of 8 months. The results showed that with both measurement methods the site of the dose maximum can be clearly determined. A site-induced variation occurred. Approximately 20% more reading could be obtained by gynecological placement of the instantaneous dosimeter in the incision. The actual radiation burden of the rectum was significantly improved over long term measurements by means of the condenser chamber. No systematic relation between the two measurement methods could be established, but the two methods agreed for each individual case. For all cases in which a high Ra dose will be attained a measurement over the first six hours with the condenser chamber is indicated. (J.S.R.)

45567 NEW RADIOBIOLOGICAL THEORIES AND THEIR SIGNIFICANCE FOR HIGH-VOLTAGE ELECTRON THERAPY. Wideroe, Rolf Strahlentherapie, Sonderbaende, 62: 299-307(1966). (In German).

Clinical results have shown favorable effects of radiation therapy with high-energy electrons. The good compatibility and recovery after irradiation makes possible high individual doses and new irradiation plans. An example shows that the survival curves obtained on irradiated cell cultures for in vivo irradiation are not directly applicable. In vivo irradiated tissues have higher recovery rates and therefore smaller death rates than cell cultures. The recovery phase is determinative for the resulting radiation sensitivity and therefore for the RBE, tissue selectivity, and clinical radiation results. The final results of irradiation depends on the two factors, primary radiation damage and subsequent secondary recovery phase. For the primary radiation damage, the size of the dose and the type of radiation are significant. High-energy electrons produce a homogeneously distributed ionization of small ion density and few δ electrons of higher energy, which end in thick ionizing ion masses. The homogeneous ionization produces, for the most part, reparable cell damage, whereas an accumulation of δ electrons can lead to sterilization or cell death. This explains the high recovery effect of high-energy electrons. Physical investigations on the measurement of inhomogeneous ionization distribution are in progress. (tr-auth)

45568 SYNERGISTIC EFFECT OF LASER RADIATION AND IONIZING RADIATION ON MALIGNANT TUMORS IN VIVO AND IN VITRO. Helsper, James T.; Sharp, George S.; Rounds, Donald E. (Pasadena Tumor Inst., Calif. Pasadena Foundation for Medical Research, Calif.). 13p. (CONF-660433–5). ORAU. Gmelin, AED-CONF-66-064-1.

From American Radium Society, 48th Annual Meeting, Phoenix, Ariz.

Cells of human adenocarcinoma in tissue culture were exposed to an unfocused beam emitted from a nominal ruby laser head for 10 exposures of 2 joules each. Similar cells were exposed to 200 R γ radiation, while other cells received laser exposure followed by γ irradiation. The cells in each suspension were counted 4 days after treatment and results were compared with untreated samples. Laser irradiation alone reduced the population to 87.7% of controls; exposure to 200 R γ radiation depressed the cell number to 82.4% of control values; and the combined treatment reduced the cell number to 49.7% of the controls. The combined effects of x radiation and laser therapy were used for therapy on a patient with extensive reticulum cell sarcoma of the skin previously treated with extensive x-radiation therapy. Approximately ten firings of 1 joule each caused the lesions to disappear in approximately 3 weeks, whereas their shortest normal life history was about 10 weeks, and most persisted for an indefinite period. Ten firings from the ruby laser combined with 300 R x radiation caused the lesions to disappear in about one week. The patient became completely symptom-free after 3 months of this therapy and remained so for approximately 6 months. (C.H.)

45569 RADIATION SAFETY HAZARD OF CHLORMERODRIN. Wade, L.; Pirtle, O. L.; Johnson, P. C. 16p. (CONF-660621–12). ORAU. Gmelin, AED-CONF-66-193-4.

From 11th Annual Meeting Health Physics Society, Houston, Tex.

Multiple injection bottles of ^{203}Hg-chlormerodrin were tested for external contamination by placing the bottles in a glass beaker containing an open vial of 15% trichloracetic acid solution and counting the activity of the TCA solution. The bottles from two suppliers were found to have external contamination while bottles from three suppliers were not contaminated. Smear samples from a storage room and a room where doses of ^{203}Hg-chlormerodrin for brain and renal scans were prepared were found to contain ^{203}Hg, as did Au wedding bands of two technicians. The levels were not sufficient to pose either a health hazard or a significant increase in the background of counting instruments. Sulfur proved to be a good absorbing medium of ^{203}Hg. It is suggested that bottles of ^{203}Hg-labeled materials be given an acid wash before use. (C.H.)

CHEMISTRY

General

Refer also to abstract 45302.

45570 (ORNL–3945, pp 189–94) CHEMICAL APPLICATIONS OF NUCLEAR EXPLOSIONS. (Oak Ridge National Lab., Tenn.).

Developments are reported for studies on: distribution and possible fate of radionuclides formed during the use of nuclear devices to aid in the recovery of copper from ore deposits; potential for production of magnesium from olivine; measurement of the rate of exchange of tritium and hydrogen in water and natural gas under conditions that may be encountered in the stimulation of gas production from wells by nuclear explosives; distribution and possible fate of radionuclides formed during the use of nuclear devices to aid in the recovery of oil from shales; and hypervelocity jet sampling as a means of removing a specimen after irradiation in the neutron flux of a detonation, but ahead of the detonation shock wave. (P.C.H.)

45571 (ORNL–3945, pp 248–55) ASSISTANCE PROGRAMS. (Oak Ridge National Lab., Tenn.).

Developments are reported for: Eurochemic Assistance Program; disposal of solid, high-level radioactive waste in salt; high-level alpha laboratory; fuel-shipping safety studies; and evaluation of radiation resistance and decontaminability of selected protective coatings. Assistance on the alpha-laboratory design included the preparation of a detailed design study for a 32-laboratory alpha facility. The program on fuel-shipping safety studies was expanded to provide more theoretical and experimental data to ensure that the shipping of spent nuclear fuels can be done in the safest possible manner in order to provide near-absolute protection to the public. A new procedure for determining the decontaminability of protective coatings was developed and tested. Data on the gamma radiation resistance rating of several protective coatings are tabulated. (P.C.H.)

Analytical Procedures

See also Separation Processes and Procedures

Refer also to abstracts 45318, 45728, 45880, 45902, 46010, and 46759.

45572 (CEA-R–3030) LA CHRONOAMPEROMETRIE LINEAIRE PAR REDISSOLUTION APPLICATION AUX HALOGENURES. (Linear Chrono-Amperometry Using Redissolution: Application to Halides). Perchard, Jean-Pierre; Buvet, Micheline; Molina, Roger (Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires). June 1966. 76p. Dep. mn.

The possibility of applying linear chronoamperometry to analysis was studied using a falling-drop mercury electrode. Measurements of the cations were carried out by direct reduction or by prior formation of an amalgam, which is then oxidized. Using the first technique, the minimum concentration that can be attained is about 10^{-6}M and the reproducibility of the results is of the order of 2%. With the second method the sensitivity is much improved: in the concentration range of 10^{-7} to 10^{-8}M, the scatter of the results is less than 10% if the agitation and temperature conditions are kept constant. The halides are determined by redissolving the mercurous halide deposit formed by electrolysis. From the analytical point of view, the sensitivity is limited in the domain where the phenomena can be interpreted and used. In the case of the chloride ion the lower limit of this zone is close to 10^{-5}M; it is 10^{-6}M for the bromide and less than 10^{-7}M for the iodide. For lower concentrations, simple laws that might be applied in analysis are no longer valid. However, the splitting of the peak observed during the reduction of the mercurous iodide deposit was interpreted as showing that the mono-molecular Hg_2I_2 layer formed on the drop has particular electrochemical properties. (auth)

45573 (DP–1046) YIELD OF ^{244}Cm IN THE SRP HIGH FLUX REACTOR. Dukes, E. K.; Folger, R. L.; Carothers, G. G.; Banick, C. J.; Donnan, M. Y. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). Aug. 1966. Contract AT(07-2)-1. 10p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Comprehensive destructive analysis of a ^{242}Pu target slug that was irradiated to 3.7×10^{22} n/cm^2 in the Savannah River Plant high flux reactor confirmed the predicted curium yield. The measured curium yield was 0.276 g for each gram of ^{242}Pu irradiated. Curium yield was determined by counting the gross alpha activity in solutions of dissolved wafers cut from the target slug (alpha pulse height analysis verified that the alpha activity was >>99% ^{244}Cm). The ^{243}Am (0.136 g for each gram of ^{242}Pu irradiated) and residual ^{242}Pu (0.511 g for each gram irradiated) were determined by mass spectrometry using the isotope dilution technique. Overall mass balance for the target slug was obtained to within 1%. (auth)

45574 (EUR–3064.f) ETUDES ANALYTIQUES SUR LE SAP. (Analytical Studies on SAP). Collin, J. L.; Serrini, G. (European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center). July 1966. 70p. Dep. mn.

Various analytical determinations for powders and sintered products of SAP are reported. The following compounds and elements were analyzed: aluminum, aluminum oxide, total and free carbon, carbonate, fats, aluminum carbide, combined nitrogen, hydrogen, water, iron, silicon, zinc, and nickel. The analytical results of aluminum oxide, total carbon, iron, silicon, and zinc were compared with the findings obtained by other laboratories doing light metal analysis. (68 references). (auth)

45575 (ORNL–3945, pp 228–9) MECHANISMS OF SEPARATIONS PROCESSES. (Oak Ridge National Lab., Tenn.).

Improvements in accuracy in the determination of radioisotopes by resolution of gamma spectra are discussed. In order to achieve resolution by coincidence counting, a method was formulated for displaying the spectra so that radioisotopes present in the sample could be identified. Mathematical resolution of the coincidence gamma spectra was achieved by modifying the ALPHA computer program. Preliminary results indicate that, for a mixture of ^{106}Ru and ^{131}I, it is possible to measure about 1 part of ^{106}Ru in the presence of 1000 parts of ^{131}I. (P.C.H.)

45576 (Y–1556) DETERMINATION OF FREE, COMBINED, AND ADSORBED CARBON IN BERYLLIUM. Postma, F. W. Jr.; Walden, G. E. (Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant). Oct. 14, 1966. Contract W-7405-eng-26. 18p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Carbon is contained in beryllium metal in three forms: combined, free, and adsorbed. To determine the amount of carbon contamination in beryllium, analytical methods are needed that can separate the carbon in its three forms and reveal the total amount of the element. Combined carbon can be determined by converting the beryllium carbide to methane and sweeping the gas into a gas chromatograph; free carbon can be filtered from the dissolved beryllium sample, ignited to carbon dioxide, and the gas swept into a conductometric cell containing barium hydroxide; and the adsorbed carbon (as CO_2 on the surface of the metal) can be separated from the beryllium by heating the sample in an inert atmosphere and sweeping the gas into the conductometric cell. (auth)

45577 NEW TECHNIQUES IN RADIOMETRIC TITRATIONS. Braun, T.; Toelgyessy, J.; Konecny, J. (Eoetvoes Univ., Budapest. Sloval Technical Univ., Bratislava). Acta Chim. Acad. Sci. Hung., 49: 131-49(1966).

Three versions of an automatic radiotitrimeter are described: a titrigraph based on precipitate formation, an automatic end-point titrator for reactions of similar types, and a titrator for radiocomplexometric titrations using solid indicators. The radiometry of traces of cobalt by EDTA is described using ion exchange for the separation of the components. Titrations were carried out in the presence of ion exchange membranes and granular ion exchange resins. The application of β absorption and back-scattering in radiometric titrations is discussed. Devices constructed for such titrations are described and the results obtained in the titration of chloride and silver are presented. (auth)

45578 THE MEASURING OF TRITIUM AND OF ^{14}C ISOTOPE WITH SINGLE- AND DUAL-CHANNEL LIQUID SCINTILLATION COUNTERS. Fodor-Csanyi, P.; Levay, B. (Electrochemistry Research Group, Hungarian Academy of Sciences, Budapest). Acta Chim. Acad. Sci. Hung., 49: 173-96(1966).

Measurement, by liquid scintillation techniques, of tritium and of ^{14}C was studied using a single-channel and a dual-channel instrument. The latter was of the coincidence circuit type. The measurements were carried out with various scintillator solutions, containing water or hydrocarbons only. In the case of aqueous samples, the effects of the composition and concentration of the scintillator solutions and of the specific activity of the samples were studied. The optimum conditions for measuring tritium with the single-channel counter were: 1,000 times amplification, 1,600 v, and discriminator voltage of 5 v. When using a Chance OX 7 optical filter, the samples were measurable after standing two hours in the dark, and the value of the sum: noise + background + phosphorescence was 4,000 impulse/100 sec. The efficiency of the detection of tritium was 41% in hydrocarbons and 19% in samples containing water. With the coincidence instrument the samples could be measured after standing for 10 min, at 1,000 times amplification with 30 and 10% efficiency, respectively, at a working voltage of 1,900 v and a discriminator voltage of 7 v. The value of the sum: noise + background + phosphorescence was 900 impulse/100 sec. The ^{14}C isotope was measured at 1,000 times amplification with the single-channel counter, in the presence of an optical filter, at 1,300 v and 20 v discriminator voltage. With the dual-channel instrument the same measurement was carried out at 1,400 v and 7 v discriminator voltage. The measuring efficiencies in the case of hydrocarbon samples were 78 and 88%, and the values of the sum: noise + background + phosphorescence were 410 and 640 impulse/100 sec, when the samples had been kept in the dark for 30 and 5 min, respectively. Measuring of the ^{14}C isotope was realized in such a way with the single-channel counter that the instrument may be satisfactorily used not only for self-diffusion experiments, but also for measuring of the small activities often encountered in medical and biological practice. The dual-channel instrument offers no advantage when measuring ^{14}C, since no significant differences were obtained with it in the measuring efficiency, in the smallest measurable activity or in the time required for the sample to be kept in the dark, while the equipment is considerably more expensive and less reliable. In the case of tritium, the possibility of measuring very small activities could not be ensured, because phosphorescence necessitated that the samples should be kept in the dark for a long period of time, and the sum of the noise + background + phosphorescence was high. The sensitivity of the equipment with coincidence circuit was higher in spite of a lower measuring efficiency, and the capacity was about ten times higher than that of the single-channel counter. By using a lead shield, it seems possible that the sensitivity of the best commercial equipment may be reached. (auth)

45579 ACTIVATION ANALYSIS OF ARSENIC IN HUMAN HAIR: SOME OBSERVATIONS ON THE PROBLEM OF EXTERNAL CONTAMINATION. Atalla, Laura T.; Silva, Celia M.; Lima, F. W. (Instituto de Energia Atomica, Sao Paulo, Brazil). An. Acad. Brasil. Cienc., 37: 433-41(1965).

To study differentiation of the way arsenic may be present in human hair, the hair of people who had worked in arsenic plants for at least five years was used. It was found that the longer the time of contact of arsenic and hair in the cases of external contamination the harder the removal of arsenic from hair, whatever the washing procedure used. In washing hair contaminated in vitro about 99% of the arsenic was removed. Under the same conditions 69 to 79% of the arsenic was removed from workers' hair. However, a total of 70 ppM was left in each case. Therefore, it is not possible to differentiate arsenic present in hair from external contamination or by metabolic excretion by using water washing procedures. (M.C.G.)

45580 RADIO-GAS CHROMATOGRAPHY. Drawert, F. Arch. Tech. Mess., Lf. 360: R8-R10(Jan. 1966). (In German).

An apparatus developed for radio-gas chromatography is suitable for trace analysis and can be combined to another unit at the injection port for reaction gas chromatography. It is possible by heating the exit and the counter to avoid condensate formation and pseudoactivity. The proportional counter uses a 1:1 to 4:1 H_2-CH_4 mixture; flow velocities of 50 ml/min H_2 may be used. Use of a difference method for determination of errors in total activity and fractional activity is possible. An example of the use of the apparatus is given for a study of the metabolism of malic acid in Saccharomyces cerevisiae. The apparatus is schematically illustrated and explained, and illustrations of typical results for chromatograms and radiograms are given. (BBB)

45581 COMPLEXES OF YTTERBIUM WITH CERTAIN ORGANIC REAGENTS. Akhmedli, M. K.; Granovskaya, P. B. Azerbaidzh. Khim. Zh., No. 5, 105-8(1965). (In Russian).

The formation of colored complexes of ytterbium with Pyrocatechol Violet, Arsenazo I, and Methylthymol blue were studied spectrophotometrically. The absorption maxima of the complexes occurred at 636, 560, and 602 mμ, respectively. The photometric determination of ytterbium should be carried out with pyrocatechol violet at pH 7.0, with arsenazo I at pH 8.0, and with methylthymol blue at pH 6.0. The composition of the complexes with all the reagents corresponds to the ratio $Yb^{3+}:R = 1:1$. The solutions of the complexes closely obey the Bouger-Lambert-Beer law. The calibration curves were plotted and the errors were determined. The study of spectrophotometric characteristics showed that of the three reagents studied, the best for determining ytterbium is methylthymol blue. (ATD)

45582 SEPARATION OF INORGANIC IONS BY REVERSED-PHASE PARTITION CHROMATOGRAPHY. Kiba, Toshiyasu. Bunseki Kagaku, 15: 991-7(Sept. 1966). (In Japanese).

Techniques, extraction systems, and solvents for separation of inorganic ions, including rare earths, by reversed-phase partition chromatography are reviewed. (J.G.B.)

45583 NONDISPERSIVE ANALYSIS OF X-RAY FLUORESCENCE EXCITED BY RADIOISOTOPE SOURCES AND ITS APPLICATIONS. Holynska, Barbara (Inst. of Nuclear Techniques, Krakow). Chem. Anal. (Warsaw), 11: 647-64(1966). (In Polish).

The principles and applications of nondispersive x-ray fluorescence analysis excited by radioisotope sources are reviewed. The most commonly applied radioisotope sources, the methods applied for the measurement of the energy and intensity of the radiations, and typical measurement geometries are considered. Special attention is given to the matrix effect as the basic factor decreasing the accuracy of the method. Several methods proposed for elimi-

nation of the matrix effect are discussed. Papers describing application of the x-ray fluorescence analysis for industrial analytical problems are reviewed. The methods of determination of various elements in alloys, ores, concentrates, and other materials are described. (auth)

45584 ACTIVATION METHOD FOR DETERMINING IRON IN FERRITE COMPUTER MEMORY. Kliment, V. (Inst. of Physics, Bratislava). Chem. Zvesti, 20: 682-6 (1966). (In Czech).

The content of iron and nickel was determined by measuring γ radiation from ^{59}Fe and ^{58}Co, respectively. The specimens and controls were irradiated with 3×10^{12} n cm^{-2} sec^{-1} for 80 hr. The iron and nickel were separated in a 2×8 Dowex alkali anion exchanger with chloride cycle. The activity and chemical separation of specimens was measured with a 400-channel spectrometer. The iron and nickel contents were determined by comparing the peaks of control materials with the peaks of the 1.10-mev ^{59}Fe spectrum and the 0.8 1-mev ^{58}Co spectrum, respectively. The method is able to determine approximately 10^{-7}g of nickel and iron. (R.V.J.)

45585 AN ELECTROMETRIC STUDY ON THE QUANTITATIVE PRECIPITATION OF NEODYMIUM(III) AS NORMAL CHROMATE. Prasad, Sarju; Nagar, Mani Shanker (Banaras Hindu Univ., Varanasi, India). Chim. Anal., 48: 452-5(Aug. 1966). (In French).

The reaction between neodymium(III) and chromate ions was studied by direct and reverse conductometric titrations at 30 ± 0.5°C in 30% ethanol, and an overall effect of ethanol concentration on the results was studied. In direct titrations sharp breaks obtained in each case lend support to the formation of normal neodymium chromate (molar ratio Nd : Cr being 2 : 3). In reverse titrations two breaks were obtained, which could be attributed to the formation of basic neodymium chromate and a mixture of basic and normal neodymium chromates. The method can be used for the microdetermination of neodymium(III). (auth)

45586 GAMMA ACTIVATION METHOD FOR DETERMINING CARBON CONTENT IN COAL. Azimov, S. A.; Masagutov, V. S.; Kasymov, A. K.; Khakimov, M. (Tashkent State Univ., USSR). Dokl. Akad. Nauk Uz. SSR, No. 2, 24-7(1966). (In Russian).

Carbon content in natural coal was measured by comparing induced activity in carbon specimens and in 40% C glucose used as control material. The prepared specimens and control were irradiated by 25-Mev bremsstrahlung. The induced photonuclear reaction (γ,n) generated positron-active isotopes, ^{11}C and ^{15}O. The threshold energy for ^{11}C was found at 18.72 Mev, the maximum yield at 22.4 Mev, a resonance energy cross section of 10.4 m barn, particle energy of 968 kev, and half life of 20.2 min with corresponding magnitudes for ^{15}O of 15.63 Mev, 22.5 Mev, 14.0 m barn, 1730 kev, and 2.02 min, respectively. Two γ-annihilation spectrometers with NaI(Tl) counters were used for measuring the specimen and control activity. The analyses showed 59% C in natural coal. The maximum order of error, at given quantum intensity, was 1 to 2%. (R.V.J.)

45587 INSTRUMENTAL NEUTRON-ACTIVATION ANALYSIS OF STANDARD ROCKS. Brunfelt, Arild O. (Univ. of Oslo); Steinnes, Eiliv. Geochim. Cosmochim. Acta, 30: 921-8(Sept. 1966).

The granite G-1, diabase W-1, and seven new "standard rocks" distributed by the U.S. Geological Survey were analyzed by neutron activation and γ spectrometry. Data for the following elements are given: chromium, cobalt, lanthanum, manganese, samarium, scandium, and sodium. The values obtained for G-1 and W-1 are in reasonable agreement with previous published data. (auth)

45588 DETERMINATION OF SMALL AMOUNTS OF THORIUM IN BIOLOGICAL MATERIAL. Pavlovskaya, N. A. (Inst. of Industrial Hygiene and Occupational Diseases, Moscow). Gig. Sanit., No. 5, 54-7(May 1966). (In Russian).

A tissue sample (50g) was treated with 15 ml of concentrated HNO_3 and 35 ml of a 32% $HClO_4$ solution in a 500-ml Kjeldahl flask heated with a gas burner. After 30 to 40 minutes of oxidation, a total of 15 ml of concentrated H_2SO_4 was added, and the flask again heated until a clear solution was obtained. The solution was diluted to 10% H_2SO_4; 10 ml of saturated oxalic acid added, and the pH adjusted to a value of 2.0 to 2.2 by adding ammonia. The thorium was precipitated by adding 25 to 30 mg of calcium as $CaCl_2$. The average coprecipitation of Th with the calcium oxalate was 84%. The calcium oxalate was filtered off, and interfering elements such as uranium, phosphate, titanium, zirconium, and others passed into the filtrate. The oxalate precipitate was dissolved in 20 to 30 ml of 6N HCl. A total of 5 to 10 mg of ascorbic acid and 0.2 ml of a 0.05% solution of Arsenazo III were added to 10 ml of the 6N HCl solution. The Th content was determined by photometry. A total of 8 samples can be run in 8 to 12 hr. The sensitivity of the method is 0.2 μg of thorium. Iron, phosphate, uranium, and zirconium do not interfere. (TTT)

45589 GRAPHICAL-MATHEMATICAL ANALYSIS OF RADIOACTIVE DECAY OF THE RaA, RaB, AND RaC MIXTURE. Malakhov, S. G.; Starikov, B. G. Gig. Sanit., No. 5, 61-5(May 1966). (In Russian).

The decay of a mixture of short-lived daughter products of radon (^{218}Po, ^{214}Pb, and ^{214}Bi) can be described as follows: $A \exp(-\lambda_1 t) + B \exp(-\lambda_2 t) + C \exp(-\lambda_3 t) = N_t \eta$. Here λ_1, λ_2 and λ_3 are the decay constants of ^{218}Po, ^{214}Pb, and ^{214}Bi; A, B, and C are constants depending on the amounts of ^{218}Po, ^{214}Pb, and ^{214}Bi at $t = 0$; $N_t \eta$ is the absolute number of disintegrations at time t; η is the reciprocal of the counting efficiency. On multiplying both sides of the equation by $\exp(\lambda_2 t)$, $A \exp(\lambda_2 - \lambda_1)t + B + C \exp(\lambda_2 - \lambda_3)t = N_t \eta \exp(\lambda_2 t)$ is obtained. The term $A \exp(\lambda_2 - \lambda_1)t$ decreases rapidly with increasing t, and at $t > 15$ min is almost equal to zero. Then an equation for a straight line remains with the variables $\exp(\lambda_2 - \lambda_3)t$ and $N_t \eta \exp(\lambda_2 t)$. At the points where $\exp(\lambda_2 - \lambda_3)t = 1$ or $\exp(\lambda_2 - \lambda_3)t = 0$, the ordinates of the straight line are equal to B + C and B, respectively. Thus B and C can be determined. The difference between $N_t \eta \exp(\lambda_2 t)$ and the corresponding ordinate of the straight line at any value of $t < 15$ min gives the value of $A \exp(\lambda_2 - \lambda_1)t$, from which it is easy to determine the value of A. A large number of experimental points can be used. The method compares favorably with the method of least squares or with the method of solving 3 equations with 3 unknowns in determining the separate concentrations of ^{218}Po, ^{214}Pb, and ^{214}Bi in air. (TTT)

45590 ANALYSIS OF ULTRA-PURE SUBSTANCES. Wang, Hou-chi; Huang, Hui-ming; Hsu, Pao-ling. Hua Hsueh Tung Pao, No. 1, 1-14(Jan. 1965). (In Chinese).

The importance of ultra-pure substances in transistor technical supplies, in the atomic energy industry, and in jet engine construction, elaborates on the methods of analyzing ultra-pure substances. These methods include radioactive, mass-spectrophotometric, spectral, polarographic, and chemical techniques. Some details are given on each of the above mentioned methods. A number of problems, including the contamination of the substances under analysis, which may be encountered in the course of the analyzing process, are discussed. (JPRS)

45591 ARSENAZO-III AS COLORIMETRIC REAGENT FOR SCANDIUM. Kuo, Chih-Ying. Hua Hsueh Tung Pao, No. 7, 52-5(July 1966). (In Chinese).

The use of arsenazo III as a colorimetric reagent for Sc is reviewed. The optimum wavelength used in the determination is 670 mμ and the sensitivity of the complex is determined by the acidity of the medium. Development of color in 0.08N HCl gives relatively high sensitivity and excellent selectivity, and determination of Sc may be thus carried out after simple separation. Photometric determinations within the range of 0.05 to 0.7 γ of scandium oxide/ml (0.06 to 0.8 γ in the presence of animal glue) follows Beer's law. The effects of acidity and other ions, stability

of the complex, and determination of Sc in refined tungsten ore are also discussed. This method is rapid with good reproducibility. (JPRS)

45592 ON THE DETERMINATION OF MICROAMOUNTS OF ^{14}C AND TRITIUM. Koch, H.; Roesseler, M.; Ploetner, D.; Modes, D. (Institut fuer Angewandte Radioaktivitaet, Leipzig). Isotopenpraxis, 2: 64-78(Feb. 1966). (In German).

The production of gases to be used for the determination of carbon-14 and tritium by wet combustion in mixtures of chromic acid–iodic acid, by dry combustion in the presence of catalysts as copper oxide, cobaltic oxide, for the decomposition products of silver permanganate as well as by reaction in a closed tube is described. The activity was measured using ionization chambers. Simple apparatuses for making routine microanalyses are described. (364 references). (auth)

45593 ISOTOPE ANALYSES OF SMALL SAMPLES. Birkenfeld, H.; Dietze, H.-J.; Zahn, H. (Institut fuer Stabile Isotope, Leipzig. Deutechen Akademie der Wissenschaften, Berlin). Isotopenpraxis, 2: 121-5(Mar. 1966). (In German).

Three examples are given for the isotope-analysis of small samples: determination of deuterated hydrocarbons with the aid of an electron-bombardment ion source; isotope analysis in a double-focusing mass spectrograph with a spark ion source; and isotope analysis with a special furnace ion source. (auth)

45594 AN IMPROVED EVAPORATION SYSTEM FOR THE ISOTOPE ANALYSIS OF SOLIDS WITH THE SOVIET MASS SPECTROMETER MI 1305. Zahn, H. (Institut fuer Stabile Isotope, Leipzig. Deutschen Akademie der Wissenschaften, Berlin). Isotopenpraxis, 2: 187-9(Apr. 1966). (In German).

An evaporation system for the Soviet mass spectrometer of MI 1305 type operating according to the principle of the Knudsen cell is described. Use of this system in solid-state mass-spectrometric isotope analysis is reported. (auth)

45595 ISOTOPE DILUTION ANALYSIS WITH STABLE ISOTOPES. PART I. EXPERIENCES IN DETERMINATION OF WATER CONTENT BY ISOTOPE DILUTION ANALYSIS WITH D_2O. Krumbiegel, P.; Huebner, H.; Rolle, W. (Institut fuer Stabile Isotope, Leipzig. Deutschen Akademie der Wissenschaften, Berlin). Isotopenpraxis, 2: 220-4(June 1966). (In German).

By the isotope dilution analysis with D_2O not only the water content of a substance or mixture, but also the possible content of acidic (exchangeable) hydrogen was determined. Calculations for water content determinations in systems without further exchangeable hydrogen and for the determination of acidic hydrogen in systems free of water are given. The water content of $BaCl_2 \cdot 2H_2O$ and silicagel was determined. An easily determined measure for the total number of acidic groups in soft coal was found. The water content of certain ores or stones can be determined by a simultaneous decomposition and isotope dilution analysis. Water content was determined in silicate iron ore with the aid of 20% hot DCl in D_2O. (auth)

45596 DETERMINATION OF IMPURITIES IN THALLIUM BY THE NEUTRON ACTIVATION METHOD. Pronin, V. A.; Gil'bert, E. N.; Artyukhin, P. I. (Inst. of Inorganic Chemistry, Novosibirsk, USSR). Izv. Sibirsk. Otd. Akad. Nauk SSSR, Ser. Khim. Nauk, 3: 88-90(1966). (In Russian).

Gamma spectrometry was combined with the rapid chemical separation of impurities to determine Sb, Ga, Fe, In, Zn, Cu, Co, As, Te, and Sn in thallium. Extraction equilibria in β, β'-dichlorodiethyl ether–water solutions of hydrochloric acid for a large number of elements indicated that Tl can be removed from 3N HCl, while Sb, Ga, and Fe can be separated from the remaining microimpurities by extraction from 9 to 10N HCl. The Co, Cu, In, Zn, As, Tl, and Sn impurity elements can be divided into two groups on the basis of different sorption capacities of fluoride complexes on an anionite. Sn, As, and Te, with a concentration of 5 to 8N Hf are sorbed on the anionite whereas Co, Cu, In, and Zn freely pass through the column. Nuclear physics characteristics of the elements Co, In, Zn, and Cu as well as Sb, Ga, and Fe, permit their identification without further chemical separation. (JPRS)

45597 SEPARATION OF RARE EARTHS BY LIQUID ION EXCHANGE. V. THIN-LAYER CHROMATOGRAPHIC SEPARATION OF MULTICOMPONENT MIXTURES OF RARE EARTHS. Holzappel, H.; Lan, Le Viet; Werner, G. (Karl-Marx-Univ., Leipzig). J. Chromatog., 24: 153-60 (Sept. 1966). (In German).

The conditions for separation of a multi-component mixture of rare earths by thin-layer chromatography are described. The separation factor of adjacent elements is enhanced by increasing the loading of the silica gel with bis(2-ethylhexyl) phosphate and decreasing the thickness of the layer. By two-dimensional elution the separation of nearly all rare earth elements is possible. (auth)

45598 METHOD FOR OXYGEN ISOTOPE ANALYSIS OF MILLIGRAM QUANTITIES OF WATER AND SOME OF ITS APPLICATIONS. O'Neil, James R.; Epstein, Samuel (California Inst. of Tech., Pasadena). J. Geophys. Res., 71: 4955-61(Oct. 15, 1966).

A method was developed by which bromine pentafluoride and small amounts of water are reacted in a nickel vessel at 80°C to liberate oxygen in 100% yield. The oxygen is converted to CO_2, which is analyzed on an isotope ratio mass spectrometer. The oxidation reaction takes place instantaneously, and the conversion of the liberated O to CO_2 requires approximately 15 minutes. There are no measurable memory effects in the method and the reproducibility is $\pm 0.1‰$. A value of 1.0407 was determined for the CO_2–H_2O fractionation factor at 25°C, a number necessary for relating standards in use by various workers. This value is in exact agreement with that obtained by Compston and Epstein in the same laboratory using a reduction technique but is in serious disagreement with values determined by other workers. An application of this technique was made to the study of a meteorological problem. (auth)

45599 ANALYTICAL USES OF 1,2-DIAMINOCYCLOHEXANE TETRA-ACETIC ACID (CDTA): DETERMINATION OF Eu^{3+} IN PRESENCE OF Cd^{2+} AND Pb^{2+} POLAROGRAPHICALLY. Jain, D. S.; Gaur, J. N. (Univ. of Rajasthan, Jaipur, India). J. Indian Chem. Soc., 43: 451-2(June 1966).

Since at and above pH 5.0, Cd^{2+} forms a nonreducible complex with (1,2-cyclohexylenedinitrilo)tetraacetic acid (CDTA) and the Eu-CDTA complex produces a well-defined diffusion-controlled reduction wave, Eu^{3+} was determined polarographically in the presence of Cd^{2+} by the standard comparison method. The method was also used successfully for the determination of Eu^{3+} in the presence of Pb^{2+}. (J.G.B.)

45600 AN ELECTROMETRIC STUDY ON THE QUANTITATIVE PRECIPITATION OF YTTRIUM(III) AS NORMAL CHROMATE. Prasad, Sarju; Nagar, Mani Shanker (Banaras Hindu Univ., India). J. Indian Chem. Soc., 43: 459-60(June 1966).

Yttrium was determined as its chromate by conductometric titrations under varied experimental conditions. Good results were obtained when the titration was carried out in a 35% ethanol solution. The method was found to be convenient for determining yttrium in micro-quantities. (J.G.B.)

45601 INFRA-RED SPECTROPHOTOMETRY OF URANYL NITRATE/TRI-n-BUTYL PHOSPHATE IN ORGANIC SOLVENTS. Ohwada, K.; Ishihara, T. (Japan Atomic Energy Research Inst., Tokyo). J. Inorg. Nucl. Chem., 28: 2343-5(Oct. 1966).

By infrared spectrophotometry, the quantitative analysis of TBP-uranyl nitrate complex ($UO_2(NO_3)_2 \cdot 2TBP$) in kerosene was investigated in the regions of P=O and U=O

stretching vibrations. It was found that the calibration curves, which were obtained by plotting the optical density at P=O(1183 cm^{-1}) and U=O(940 cm^{-1}) vibration bonds against the concentration of $UO_2(NO_3)_2 \cdot 2TBP$, obeyed the Beer-Lambert law in the ranges of 0.0005–0.05 mol/l of $UO_2(NO_3)_2 \cdot 2TBP$. (auth)

45602 FREEZING TECHNIQUE IN NEUTRON ACTIVATION ANALYSIS. Brune, D.; Landstroem, O. (Aktiebolaget Atomenergi, Studsvik/Nykoeping, Sweden). Radiochim. Acta, 5: 228-30(July 1966).

An investigation concerning neutron activation analysis of aqueous samples, consisting of water solutions and whole blood irradiated in the solid phase by freezing the samples to a temperature of −40°C, is discussed. The freezing technique offers various advantages: the pressure in the ampoules caused by the radiolysis of water is considerably reduced when the aqueous samples are irradiated in the solid phase; losses of activities due to vaporization effects as well as the adsorption of activities on container walls are strongly suppressed; and the interference of nuclides from container walls is avoided. The freezing technique was applied in the determination of organically bound iodine in aqueous solutions, of mercury in whole blood, and of antimony, arsenic, bromine, cadmium, copper, mercury, molybdenum, selenium, sodium, tungsten, and uranium in water. (auth)

45603 RESOLVING RADIONUCLIDE BINARY MIXTURES WITH A LINEAR EQUATION INVOLVING DECAY MEASUREMENTS IN TWO SPECTRAL CHANNELS. APPLICATION TO THE ^{101}Mo–^{101}Tc SYSTEM. Johnson, Ralph A. (Shell Development Co., Emeryville, Calif.). Radiochim. Acta, 5: 231-3(July 1966).

A simple linear equation for resolving binary radionuclide mixtures was derived. The data required were count rates in two spectral regions taken over a series of decay times. The only constant needed to be known was the half life of the nuclide being determined. This method has found application, in particular, in the determination of molybdenum via neutron activation and the $^{101}Mo-^{101}Tc$ system, a decay system involving two closely similar half lives. (auth)

45604 THE DETERMINATION OF PLUTONIUM IN URANIUM–PLUTONIUM SOLUTIONS BY DIRECT ALPHA COUNTING. Moeken, H. H. Ph. (Eurochemic, Mol, Belg.). Radiochim. Acta, 5: 241-2(July 1966).

A method is described for the quick determination of plutonium, which is sufficiently precise for process control. The technique is based on the direct counting of the Pu and U alpha particles and correction of the counting result for the contribution of the known uranium content. The total alpha count rate, R counts/sec, is related to the amounts of Pu and U on the counting plates by the equation $R = B_{Pu} \times Pu + Bu_u \times U$, in which B_{Pu} and B_u are experimentally determined coefficients. The design of the experiment makes it possible to analyze the variance and to estimate the total error in the activity measurement and its component errors due to the counting and due to the source preparation. The relative standard deviations were 2.3%, 1.5%, and 1.7% in the experiments performed. (D.H.M.)

45605 ANALYTICAL DETERMINATION OF AMERICIUM, PLUTONIUM, AND URANIUM BY MEANS OF AMP (PYRIDINE AMINATED) ANIONITE. Vorobev, V. M.; Fomicheva, V. I. Radiokhimiya, 7: 728-9(1965). (In Russian).

The anion-exchange resin AMP, a strongly basic copolymer of styrene, chloromethylated and aminated with pyridine, was used for the quantitative separation of americium, plutonium, and uranium, taking advantage of the differential sorption of U(VI), Pu(IV), Pu(III), and Am(III) ions from hydrochloric solutions. When a solution of these ions in hydrochloric acid is sent through the resin column, the uranium is retained on the resin and may be desorbed by means of a 0.1 M hydrochloric acid. In order to separate the plutonium from americium, the former is oxidized to its tetravalent state with sodium nitrate; the solution is passed through the column and the Pu(IV) ions are retained while the americium passes through. The plutonium may be removed by means of a 0.4 M hydrochloric acid solution. The three elements may be quantitatively determined on the basis of their α activity. The method may be used to separate trace amounts of the three elements. Under the experimental flow conditions used in the column, about 0.5 cm^3 or 0.3 g of the resin adsorb about 1.5 mg of uranium or plutonium. For more concentrated solutions, the volume of the column must be increased. (TTT)

45606 RADIOACTIVATION METHOD OF DETERMINING THE PRESENCE OF GOLD IN BLOOD. Bagdavadze, N. V.; Barbakadze, L. V.; Ginturi, E. N.; Kuchava, N. E.; Mosulishvili, L. M.; Kharabadze, N. E. (Inst. of Physics, Georgian Academy of Sciences, USSR). Soobshch. Akad. Nauk Gruz. SSR, 39: No. 2, 287-94(1965).

A simple and exact quantitative determination of gold in blood and in its components is described. A test sample and a standard containing a known quantity of gold are irradiated simultaneously by $10^{13}n/cm^2$ sec thermal neutrons for 70 hours. The proportion of 411.8 kev γ quanta is the measure of the radioactive gold content. Preparation of the samples and standards and the chemical treatment of the irradiated samples, in addition to the technique used to separate the gold from radioactive impurities in an ion exchange column, are described. Measurements are made following a 5-day interval, obviating the necessity of carrying out the experiments near the reactor. Experiments were carried out on 10 to 15 samples of healthy human blood, and curves are shown for the content of gold in the plasma of whole blood and in erythrocytes, the latter containing by far the larger proportion of gold. (JPRS)

45607 SPECTROCHEMICAL DETERMINATION OF ^{235}U. PART 1. D.C. ARC EXCITATION METHOD. Nishihara, Kiyokado; Matsumura, Yoshitaka (Kyoto Univ.). Suiyokaishi, 15: 507-12(Mar. 1966). (In Japanese).

A method for determining ^{235}U concentrations in U_3O_8, using the isotope shift of spectral lines in the optical spectrum, was studied. For excitation of samples, d-c arc techniques were used with a spectroscopic buffer. Various spectrocopic buffer and carrier materials were examined, using the moving plate method; Bi_2O_3 was found to be a more suitable buffer than ZnO or graphite powder. In standard and analytical samples, the ratio of U_3O_8 to Bi_2O_3 was 1:1 by weight. Other analytical conditions were as follows: sample size: 24 mg, arc current: 6A, electrode gap: 2 mm, lower electrode: anode, pre-burn time: 80 sec, exposure time: 80 sec, analytical line pair: ^{235}U 4244.124/^{238}U 4244.372 Å. The analytical working curve was prepared over the range of 0.712 to 20.26% ^{235}U with a precision of 2.6 to 7.0%. (NSA of Japan)

45608 DETERMINATION OF ^{140}Ba IN FISSION PRODUCTS BY SUBSTOICHIOMETRY. Park, Keung Shik; Lee, Chul (Atomic Energy Research Inst., Seoul). Ta Han Hua Hsueh Hui-Chih, 9: 113-15(1965).

A simple and rapid method for the determination of fission products by means of a smaller amount of reagent than that corresponding to the stoichiometric ratio of element to be determined was investigated. The yield of ^{140}Ba in fission products was determined by this method. (auth)

45609 USE OF PYRAZOLONE DERIVATIVES FOR FLUOROMETRIC DETERMINATION OF DYSPROSIUM. Tishchenko, M. A.; Kononenko, L. I.; Vitkun, R. A.; Poluektov, N. S. (Inst. of General and Inorganic Chemistry, Odessa). Ukr. Khim. Zh., 32: 508-13(1966). (In Russian).

The feasibility of using phenyl-3-methylpyrazolone-5 (PMP) and tolyl-3-methylpyrazolone-5 (TMP) to replace 4-sulfophenyl-3-methylpyrazolone-5 (SPMP) for fluorometric determination of dysprosium in oxides of other rare earth elements was studied. The usefulness of SPMP for determining dysprosium in the presence of terbium was limited due to partial superposition of the fluorescence bands and by the bright fluorescence of trivalent terbium ions. The reagents were used in the form of a 2.5% solution in ethanol. The fluorescence spectrum for complex

compounds of Dy and Tb with the tolyl derivative showed three bright bands in the visible region for the Tb complex with maxima at 488 to 497.5, 543 to 546, and 580 mμ and two bands for the Dy complex with maxima at 482.5 to 487.5 and 573 mμ. The best bands for quantitative identification were at 573 mμ for Dy and at 543 to 546 mμ for Tb. Experiments were conducted to determine the effect of various factors on the luminescence intensity of a complex compound of Dy with PMP and TMP. The greatest relative luminescence intensity was observed in a solution with a pH of 6 to 7 with 5 mg of reagent in a total volume of 10 ml, allowing the solution to stand for 40 minutes after adding the reagents. The method developed for fluorescence determination of dysprosium may be used for identification of this element in mixtures of rare earth oxides with a sensitivity of 0.005 to 0.1% Dy_2O_3 depending on the nature of the basic element. (ATD)

45610 PHOTOCOLORIMETRIC DETERMINATION OF CERIUM WITH PHENYLANTHRANILIC ACID. Bondareva, T. N.; Shvarev, V. S.; Perkina, V. P. (Ural State Univ., USSR). Zavodsk, Lab., 32: 907-9(1966). (In Russian).

Photometric determination of cerium with phenylanthranilic acid was studied at the maximum light absorption at λ 430 nm and complex composition Ce(IV): PAA = 3 : 2. The molar quenching coefficient was 15.4×10^3. The order of error for determining 0.005 to 0.2% Ce in lanthanum was 1.6×10^{-4} and 1.2 to 10^{-2}%, respectively. (R.V.J.)

45611 USE OF CINNAMIC ACID IN ANALYTICAL CHEMISTRY. COMMUNICATION 8. PRECIPITATION OF THE RARE EARTH ELEMENTS AND YTTRIUM AND THEIR SEPARATION FROM MANGANESE, NICKEL, COBALT, ZINC, CALCIUM, AND MAGNESIUM. Ostroumov, E. A.; Volkov, I. I. (Inst. of Oceanology, Moscow). Zh. Anal. Khim., 21: 1050-7(1966). (In Russian).

The rare earth elements and yttrium can be quantitatively precipitated with an ammonium cinnamate solution (about 5% of cinnamic acid) from weakly acid solutions on heating. The initial pH value should be of about 3.5. The precipitates are crystalline and by their composition correspond to neutral cinnamates having a general formula $R(C_6H_5CH:CHCOO)_3$ where R is one of the elements. These compounds can be calcined to oxides. In this way the rare earth elements and yttrium can be separated from manganese, nickel, cobalt, zinc, calcium, and magnesium. (auth)

45612 EXTRACTION SEPARATION OF RARE EARTH ELEMENTS FOR THEIR FOLLOWING DETERMINATION. Galkina, L. L.; Glazunova, L. A. Zh. Anal. Khim., 21: 1058-63(1966). (In Russian).

An extraction method was developed for separating rare earths from iron, aluminum, titanium, niobium, tantalum, zirconium, tin, tungsten, and molybdenum by extraction with butyric acid using sulfosalicylic acid as a masking agent. A method was suggested for the rapid gravimetric determination of total rare earths and for concentrating small amounts of them in mineral samples. The method was tested on silicate ores and the results obtained were satisfactory. (auth)

45613 DETERMINATION OF URANYL BY ITS CATALYTIC ACTION ON PHOTOLYSIS OF OXALATES. Babko, A. K.; Ginzburg, L. M. (Kiev State Univ.). Zh. Anal. Khim., 21: 1070-4(1966). (In Russian).

A possibility was shown of using $H_2C_2O_4$ photolysis in the presence of uranyl ions for uranyl determination. It was established that when $H_2C_2O_4$ is illuminated during a long time photolysis takes place in the absence of uranyl ions and has an induction nature (20 to 30 min). The optimum conditions for uranyl determinations are illumination for 10 to 15 min and pH 2 to 2.5. The slowing down of the acid photolysis in the presence of methyl methacrylate shows that this process has a radical nature. Titrimetric and photometric methods were developed for determining uranyl with a sensitivity of about 15 μg of uranyl in 10 ml. (auth)

45614 ARSENAZO III AND ITS ANALOGS AS REAGENTS FOR PLUTONIUM. Savvin, S. B.; Milyukova, M. S. (Vernadskii Inst. of Geochemistry and Analytical Chemistry, Moscow). Zh. Anal. Khim., 21: 1075-81(1966). (In Russian).

A number of bisazo dyes based on chromotrophic acid containing an o-arsono-o'-hydroxyazo functional-analytical group and an o,o'-dihydroxyazo functional-analytical group were studied as reagents for plutonium (IV). The reagents of the first class interacted with plutonium in strongly acid media (1 to 4N HNO_3) with high sensitivity (the molar extinction coefficients were of the order 60,000 to 120,000), but their selectivity was not very high (Th, U, Zr, rare earth, and other elements interfered). The reagents of the second class interacted with plutonium (IV) in less strongly acid media (0.1 to 1N HNO_3), they were less sensitive (the molar extinction coefficients were of the order of 30,000 to 60,000) but more selective (Zr, Nb, Mo interfered). The best reagents studied for determining plutonium in aqueous solutions were arsenazo III and arsenazo-amino-ε-acid. (auth)

45615 PHOTOMETRIC DETERMINATION OF TRACE THORIUM WITH ARSENAZO III IN PREPARATIONS CONTAINING LARGE AMOUNTS OF ZIRCONIUM AND URANIUM. Karalova, Z. K.; Shibaeva, N. P.; Pyzhova, Z. I. Zh. Anal. Khim., 21: 1133-5(1966). (In Russian).

A method is described for determining thorium using Arsenazo III in 0.5N H_2SO_4 + 0.5N HCl after its separation from 10,000 times as much of zirconium and 50,000 as much of uranium by means of an AB-17 anion exchange resin in 1N H_2SO_4. (auth)

45616 RADIOACTIVE ISOTOPE DILUTION ANALYSIS. Revised Edition 1966. Gorsuch, T. T. Amersham, Eng., Radiochemical Center, 1966. 12p.

The principle of radioactive isotope dilution analysis is described and equations derived to illustrate how the calculations are made following analysis. Specific developments concerning derivative dilution analysis and saturation analysis are discussed in detail and examples are given. A bibliography of 12 references concerning the technique is included. (B.L.M.)

45617 CONTROLLED ATMOSPHERE D-C ARC FOR THE QUANTITATIVE DETERMINATION OF RARE EARTHS IN CALCIUM FLUORIDE. Nash, D. L. (Bell Telephone Labs., Inc., Murray Hill, N. J.). 11p. (CONF-650311-8). ORAU.

From Conference on Analytical Chemistry and Applied Spectroscopy, Pittsburgh.

Optimum controlled atmosphere conditions for the determination of rare earths in calcium fluoride are discussed and the specific technique evolved for the determination of terbium and holmium are described. The limits of detection and precision of the d-c are powder method are given. (auth)

45618 SOME APPLICATIONS OF ION-EXCHANGE RESINS IN ACTIVATION MICROANALYSIS. Aubouin, G.; Diebolt, J.; Junod, E.; Laverlochere, J. (CEN, Grenoble, France). 17p. (CONF-650405-21). ORAU. Gmelin AED-CONF-65-040-34.

From International Conference on Modern Trends in Activation Analysis, College Station, Tex.

Ion exchange resins are useful for radiochemical separations because of their excellent separation yields, which permit accurate operation, very often without carriers, and yield maximum sensitivity for a given irradiation. They give high decontamination factors, in most cases, with only one separation step, because of the great number of theoretical plates obtained in the column technique. Their known capacity permits the conduction of quantitative separations by means of the substoichiometric technique, in the same manner as with a standard reagent. Ion-exchange separations were applied for the analysis of highly purified materials, such as Ge, and for matrices which have high neutron activation cross sections, such as Rh, where it is necessary to have good radiochemical separations and to operate in a hot cell. Other examples, such as activation analysis for trace elements in sea

water, are also given to illustrate the possibilities of the techniques of "hot activation analysis" and substoichiometric separations using ion-exchange resins. (B.L.M.)

45619 APPARATUS FOR INDICATING THE METAL OXIDE CONTENT OF A LIQUID METAL. Eames, Anthony Rainsford; Butler, Joseph Kenneth (to United Kingdom Atomic Energy Authority). British Patent 1,042,144. Sept. 14, 1966. Filed Nov. 10, 1961.

An apparatus is described that facilitates the detection of changes in liquid metal resistivity characteristic of the presence of metal oxide particles in a stream of liquid metal flowing at a predetermined velocity. The apparatus includes a pipe branched to form a closed loop with opposed inlet and outlet connections. An induction coil is electromagnetically linked with the loop to induce an alternating current flow around the loop in the liquid metal. A probe coil is also linked electromagnetically with the loop to derive a voltage signal due to the a-c flow and representative of the resistivity of the liquid metal. A discriminator receives the voltage signal and yields a preferential output in response to pulses with a rate of rise greater than the minimum number predetermined to correspond to a metal oxide particle entrained in the liquid metal as it flows through the pipe. (B.L.M.)

45620 METHOD FOR DISCRIMINATING RADIOACTIVE ISOTOPES AND ARRANGEMENT FOR CARRYING OUT THIS METHOD. Kimmel, Hermann. German Patent 1,221,366. June 21, 1966. Filed June 10, 1963.

Various radioactive isotopes are discriminated in mixtures by means of two coincidence counters separated by an absorption foil. An integrating differential circuit supplies the difference between the pulse rates of the two counters. The differential circuit is adjusted by varying the amplitude and duration of the pulses of one of the counters so that the difference is zero for a predetermined average radiation energy. (Gmelin Inst.)

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Refer also to abstracts 46013, 46086, 46087, 46152, and 46947.

45621 (AD-640612) DIRECT EVIDENCE FOR AND TRANSITION RATES OF ION PAIR INTERACTIONS IN $LaCl_3$:Ho^{3+}. Porter, J. F. Jr.; Moos, H. W. (Johns Hopkins Univ., Baltimore, Md. Dept. of Physics). [1966]. 27p. CFSTI $2.00 cy, $0.50 mn.

Energy transfer between Ho^{3+} ions in a $LaCl_3$ lattice was studied by means of relative fluorescence intensity measurements. By careful measurements of the relative fluorescence from $E(^5S_2)$, $C(^5I_4)$, and $Y(^5I_7)$ it was demonstrated that to within the experimental error, E relaxes to C only by an ion pair process. The concentration dependence of the pair process is linear. Assuming a simple model with a sharp radial drop off, an effective range of 7.5 Å (3rd nearest neighbor) was found for the ion pair interaction. (auth)

45622 (BM-RI-6834) INFLUENCE OF REPETITIVE ELECTROLYSIS ON WINNING MOLYBDENUM. Heinen, Harold J.; Baker, Don H. Jr. (Bureau of Mines, Washington, D. C.). 1966. 11p. Bureau of Mines Free.

Repetitive batch electrowinning of Mo from MoO_3 was studied to determine the effects upon the electrolyte life, purity of metal product, and overall cell performance. The electrolyte consisted of 54.0 wt % $Na_2B_4O_7$, 23.6 wt % NaCl, 14.9 wt % NaF, and 7.5 wt % MoO_3. The feed materials were pure and technical-grade MoO_3. Electrolysis was conducted at 1,000°C in a graphite cell in an atmosphere of air and carbon oxides. Electrolyte degradation did not occur during repetitive winning of Mo from pure MoO_3 in an 8-day (5,400-ampere-hour) period of operation. Electrowon metal contained <0.1 percent total impurities. The electrode configuration is a key factor in the direct conversion of technical-grade MoO_3 to metal by repetitive cyclic electrolysis. The best configuration found was a cathodic crucible and a central anode. Metal purity of 99.8% and a current efficiency of 91% were maintained until the combined impurity buildup in the electrolyte reached 4.7% Si, 1.0% Al, and 0.6% Fe. One pound of Mo was produced per 1.5 lbs of solvent salts employed. About 25% of the initial NaCl and NaF contents of the electrolyte were lost owing to volatilization and crucible penetration. (auth)

45623 (IS-1450) STABILITY CONSTANTS OF RARE EARTHS WITH SOME WEAK CARBOXYLIC ACIDS. Kovar, Lawrence E.; Powell, J. E. (Ames Lab., Iowa State Univ. of Science and Tech.). Oct. 1966. Contract W-7405-eng-82. 54p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

The complex formation constants of species formed by the rare earths, except promethium, with the formate, acetate, chloro-acetate, and iodoacetate ligands were determined potentiometrically using a variable K_a. The stability constants were computed via a least squares technique using an IBM 7074 computer at an ionic strength of 0.10 ($NaClO_4$) and a temperature of 25°C. The acetate constants were found to be lower for the heavier rare earths than the light rare earths. The iodoacetate, formate, and chloroacetate constants followed the same general trend as the acetate constants. The halogens contributed little, if any, to chelate formation with the rare earth ions. (auth)

45624 (JUL-383-RB) THERMODYNAMISCHE STOFFWERTE VON LUFT, KOHLENDIOXYD UND STICKSTOFF BEI HOHEN TEMPERATUREN UND DRUECKEN. (Thermodynamic Values for Air, Carbon Dioxide, and Nitrogen at High Temperatures and Pressures). Hammeke, K.; Pietralla, G.; Presser, K. H. (Kernforschungsanlage, Juelich (West Germany). Institut fuer Reaktorbauelemente). July 1966. 52p. Dep. mn.

In the evaluation and dimensionless representation of heat transfer and pressure loss measurement, values at higher pressures and temperatures were necessary. The density, specific heat, dynamic multiplicity, and the heat conductivity of air, carbon dioxide, and N were inferred for temperatures up to 1,300°K and for pressures up to 80 atm. Sufficiently accurate formulas were developed for use in electronic data processing installations and tables were prepared. At high temperatures and pressures very few experimental data are available. The uncertainties are very large for the parameters c_p, μ, and λ. Only a relatively small pressure effect, which lies within the measurement accuracy, was found from the measurements. (tr-auth)

45625 (MCW-1448) GREEN SALT-WATER EQUILIBRIUM STUDIES. Fleming, W. S.; Leifield, R. F. (Mallinckrodt Chemical Works, Weldon Spring, Mo. Uranium Div.). Aug. 1, 1966. Contract W-14-108-eng-8. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Water sorption values were determined for UF_4, UO_2F_2, and mixtures of these compounds ("green salt") in equilibrium with water vapor. Water sorbed onto UF_4 increased with increasing surface area and water vapor pressure over the material and decreases with increasing temperature. The amount of water vapor sorbed by UO_2F_2 between 100 and 300°C and from 2 to 15 mm of Hg water vapor pressure was essentially constant at 300 ppM H_2 for UO_2F_2 with a surface area of 4.7 m^2/g; this level corresponds to $UO_2F_2 \cdot 0.05H_2O$. Results showed that sorption values of UO_2F_2 and UF_4 are additive and may be used to estimate equilibrium water contents of mixtures of these two compounds (green salt). Heats of sorption and free energy changes for water vapor sorption onto UF_4 and green salt were determined. The process was found to be essentially physical in nature as average heats of sorption onto UF_4 ranged from 9 to 10 kcal/mole. Surface area effects upon water vapor sorption were investigated for UF_4, UO_2F_2, and green salt. Water sorption data, surface area measurements, and infrared studies indicate that approximately 1% (absolute) of the UO_2F_2 contained in production-grade green salt is "cored," i.e., contained within UF_4 particles. (auth)

45626 (NASA-CR-591) ANALYSIS OF VAPORIZATION OF LIQUID URANIUM, METAL, AND CARBON SYSTEMS AT 9000 DEG AND 10,000 DEG R. Kaufman, L.;

Peters, E. T. (Manlabs, Inc., Cambridge, Mass.). Sept. 1966. 47p. CFSTI $2.00 cy, $0.50 mn.

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45634 RADIOISOTOPIC EXCHANGE AND ULTRAVIOLET SPECTRA OF RARE-EARTH METAL OXALATES. Grzymalski, Z.; Jezowska-Trzebiatowska, B.; Ziolkowski, J. (Univ., Wroclaw). Bull. Acad. Pol. Sci., Ser. Sci. Chim., 14: 381-7(1966).

Radioisotopic heterogenous exchange of rare earth and thorium oxalates was studied in the system: $(Ln_2Ox_3)_{solid} + (M_2Ox)^*_{liquid} \rightleftharpoons (Ln_2Ox_3)^*_{solid} + (M_2Ox)_{liquid}$ where Ln is the lanthanide ion, Ox* is the oxalate ion labeled with ^{14}C, and M is the alkali-metal or hydrogen ion. The exchange rate depended to a great extent on the hydrogen ion concentration and stability of the oxalate complex, which may be formed under the condition of the exchange reaction. The results of studies on the kinetics of the exchange process indicated some differences between the individual rare earth oxalates which, in conjunction with the data obtained for Sc, Ce, and Th oxalates from the uv absorption spectra, gave new evidence on the problem of metal-oxygen bond in these compounds. (D.H.M.)

45635 PHASE CHARACTER OF NICKEL DEUTERIDE. Stroka, A.; Baranowski, B. Bull. Acad. Pol. Sci., Ser. Sci. Chim., 14: 419-24(1966).

A study was made to determine the maximum content of deuterium in cathodically charged nickel layers as a function of current density and of the potential of the investigated cathodes at a constant charging temperature, and to determine the maximum D/Ni atomic ratio as the function of the charging temperature at constant current density. A nickel deuteride beta phase with the atomic maximum ratio D/Ni equal to 0.8 was produced. (M.C.G.)

45636 SOLUBILITY OF THE CARBONATES OF YTTRIUM, SCANDIUM, AND SEVERAL RARE EARTH ELEMENTS IN WATER CHARGED WITH CARBON DIOXIDE. Trombe, Felix; Blaise, Michele; Caro, Paul (CNRS, Bellevue, France). Compt. Rend., Ser. C, 263: 521-4 (Aug. 17, 1966). (In French).

The experiments were carried out at atmospheric pressure between 0 and 72°C in aqueous solutions in equilibrium with pure carbon dioxide or at different concentrations in argon. At 22°C, under a carbon dioxide pressure of 760 mm of Hg, the following solubilities were found (expressed in mg of oxides per liter): La_2O_3, 3 to 4; CeO_2, 2; Pr_6O_{11}, 22.5; Nd_2O_3, 28; Er_2O_3, 80; Y_2O_3, 35; and Sc_2O_3, 100. The solubility of the preceding carbonates increased when the temperature of the solution was decreased. At 0°C under a pressure of carbon dioxide of 760 mm of Hg, Y_2O_3, 60 and Sc_2O_3, 150 are found. The preceding results are qualitatively comparable to those obtained for the alkaline earth carbonates. (tr-auth)

45637 PREPARATIVE AND X-RAY CRYSTALLOGRAPHIC DATA ON POTASSIUM DITHORIUM TRISPHOSPHATE, $KTh_2(PO_4)_3$. Matkovic, B.; Sljukic, M.; Prodic, B. (Inst. Ruder Boskovic, Zagreb). Croat. Chem. Acta, 38: 69-70(1966).

Single crystals of $KTh_2(PO_4)_3$ were obtained by heating a mixture of 3.0 g K_2HPO_4, 1.3 g ThO_2, and 2.5 g KCl at 1200°C for 24 hours. The insoluble residue left after boiling in water, was heated again with 3.0 g K_2HPO_4 and 3.0 g B_2O_3 at 1200°C for 24 hours. The crystals of $KTh_2(PO_4)_3$ are monoclinic prisms. Space group in $C2/c-C^6_{2h}$ with unit cell dimensions a = 17.55, b = 6.86, and c = 8.14 Å, and $\beta = 101°52'$ (Z = 4). The coordinates of thorium atom x = 0.154, y = 0.093, z = 0.034 were determined from Patterson projections and improved by three-dimensional Fourier synthesis. The complete crystal structure determination is now in progress. (auth)

45638 PREPARATION OF ANHYDROUS FLUORIDES OF RARE-EARTH ELEMENTS. Li, Chun-Chiu. Hua Hsueh Tung Pao, No. 7, 27-33(July 1966). (In Chinese).

A survey was made of the subject, based primarily on Western literature. The material is presented under the following subheadings: fundamental principle of preparation of anhydrous fluorides of rare earth elements; methods of preparation of anhydrous fluorides of rare earth elements such as fluorination by hydrogen fluoride, fluorine gas, ammonium hydrogen fluoride, and precipitation with hydrofluoric acid; purification of fluorides of rare earth elements; and conclusion. (JPRS)

45639 PHASE EQUILIBRIA IN THE YTTERBIUM OXIDE–ALUMINA SYSTEM AND THEIR COMPARISON WITH EQUILIBRIA IN OTHER Ln_2O_3–Al_2O_3 SYSTEMS. Bondar, I. A.; Toropov, N. A. (Inst. of Silicate Chemistry, Academy of Sciences, USSR). Izv. Akad. Nauk SSSR, Ser. Khim., No. 2, 212-18(1966). (In Russian).

Phase diagrams were constructed for the $Yb_2O_3-Al_2O_3$ and $Sm_2O_3-Al_2O_3$ systems. X-ray studies confirmed the compounds $2Yb_2O_3 \cdot Al_2O_3$ and $3Yb_2O_3 \cdot 5Al_2O_3$. The physical properties of the La, Er, Sm, Y, Tb, and Yb aluminates were compared. The infusibility, hardness, density and chemical resistance of the rare earth aluminates helps make them suitable for high frequency ceramics, luminophores, materials for absorption of neutrons and protection against gamma radiation, and materials resistant to high temperature and aggressive media. (ATD)

45640 EFFECT OF GAS MEDIUM AND TEMPERATURE ON THE REACTIONS IN THE Ce–Ti–O SYSTEM AND THE COMPARISON OF PROPERTIES OF SOME RARE-EARTH TITANATES. Leonov, A. I.; Piryutko, M. M.; Keler, E. K. (Grebenshchikov Inst. of Chemistry of Silicates, Academy of Sciences, USSR). Izv. Akad. Nauk SSSR, Ser. Khim., No. 5, 787-92(1966). (In Russian).

Reactions in a Ce–Ti–O system heated in air, argon, CO_2, H_2, and NH_3 were studied in the temperature range from room temperature to 1600°C. The new chemical compound $CeO_{1.6} \cdot 2\ TiO_2$, synthesized in argon and CO_2, and another, with perovskite type structure, $(Ce_2O_3)_{1\pm x}$ $3\ TiO_{2-y}$, synthesized in hydrogen and NH_3, have the tendency to disintegrate when heated in air. Studies of the

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45633 CALCULATION OF THE INTENSITIES OF THE ISOTOPE PEAKS IN MASS SPECTRA OF COMPOUNDS $C_xH_yRu_zO_w$. Herlan, Albert (Technische Hochschule, Karlsruhe, Ger.). Brennstoff-Chem., 47: 150-5(May 1966). (In German).

A method for the calculation of intensities of isotope peaks in mass spectra of empirical formula $C_xH_yRu_zO_w$ was developed. The procedure includes determination of intensity distributions for individual elements and of the total distribution. Numerical results, based on a table of best isotopic distributions for H, C, O, and Ru, are reported for combinations of several C, O, and Ru atoms, for distributions in high-molecular-weight paraffins, and for $Ru_3(CO)_{12}$. The expressions, derived in general terms may be applied to any combination of elements. Tables include probabilities of up to 4 ^{13}C atoms among 12 C, up to 6 heavy O atoms among 12 O, distributions for 2 and 3 Ru atoms, and selected data from a table of hydrocarbons with probabilities up to 14 heavy atoms among 1000 C. (BBB)

45634 RADIOISOTOPIC EXCHANGE AND ULTRAVIOLET SPECTRA OF RARE-EARTH METAL OXALATES. Grzymalski, Z.; Jezowska-Trzebiatowska, B.; Ziolkowski, J. (Univ., Wroclaw). Bull. Acad. Pol. Sci., Ser. Sci. Chim., 14: 381-7(1966).

Radioisotopic heterogenous exchange of rare earth and thorium oxalates was studied in the system: $(Ln_2Ox_3)_{solid} + (M_2Ox)^*_{liquid} \rightleftharpoons (Ln_2Ox_3)^*_{solid} + (M_2Ox)_{liquid}$ where Ln is the lanthanide ion, Ox* is the oxalate ion labeled with ^{14}C, and M is the alkali-metal or hydrogen ion. The exchange rate depended to a great extent on the hydrogen ion concentration and stability of the oxalate complex, which may be formed under the condition of the exchange reaction. The results of studies on the kinetics of the exchange process indicated some differences between the individual rare earth oxalates which, in conjunction with the data obtained for Sc, Ce, and Th oxalates from the uv absorption spectra, gave new evidence on the problem of metal-oxygen bond in these compounds. (D.H.M.)

45635 PHASE CHARACTER OF NICKEL DEUTERIDE. Stroka, A.; Baranowski, B. Bull. Acad. Pol. Sci., Ser. Sci. Chim., 14: 419-24(1966).

A study was made to determine the maximum content of deuterium in cathodically charged nickel layers as a function of current density and of the potential of the investigated cathodes at a constant charging temperature, and to determine the maximum D/Ni atomic ratio as the function of the charging temperature at constant current density. A nickel deuteride beta phase with the atomic maximum ratio D/Ni equal to 0.8 was produced. (M.C.G.)

45636 SOLUBILITY OF THE CARBONATES OF YTTRIUM, SCANDIUM, AND SEVERAL RARE EARTH ELEMENTS IN WATER CHARGED WITH CARBON DIOXIDE. Trombe, Felix: Blaise, Michele; Caro, Paul (CNRS, Bellevue, France). Compt. Rend., Ser. C, 263: 521-4 (Aug. 17, 1966). (In French).

The experiments were carried out at atmospheric pressure between 0 and 72°C in aqueous solutions in equilibrium with pure carbon dioxide or at different concentrations in argon. At 22°C, under a carbon dioxide pressure of 760 mm of Hg, the following solubilities were found (expressed in mg of oxides per liter): La_2O_3, 3 to 4; CeO_2, 2; Pr_6O_{11}, 22.5; Nd_2O_3, 28; Er_2O_3, 80; Y_2O_3, 35; and Sc_2O_3, 100. The solubility of the preceding carbonates increased when the temperature of the solution was decreased. At 0°C under a pressure of carbon dioxide of 760 mm of Hg, Y_2O_3, 60 and Sc_2O_3, 150 are found. The preceding results are qualitatively comparable to those obtained for the alkaline earth carbonates. (tr-auth)

45637 PREPARATIVE AND X-RAY CRYSTALLOGRAPHIC DATA ON POTASSIUM DITHORIUM TRISPHOSPHATE, $KTh_2(PO_4)_3$. Matkovic, B.; Sljukic, M.; Prodic, B. (Inst. Ruder Boskovic, Zagreb). Croat. Chem. Acta, 38: 69-70(1966).

Single crystals of $KTh_2(PO_4)_3$ were obtained by heating a mixture of 3.0 g K_2HPO_4, 1.3 g ThO_2, and 2.5 g KCl at 1200°C for 24 hours. The insoluble residue left after boiling in water, was heated again with 3.0 g K_2HPO_4 and 3.0 g B_2O_3 at 1200°C for 24 hours. The crystals of $KTh_2(PO_4)_3$ are monoclinic prisms. Space group in $C2/c - C^6_{2h}$ with unit cell dimensions a = 17.55, b = 6.86, and c = 8.14 Å, and $\beta = 101°52'$ (Z = 4). The coordinates of thorium atom x = 0.154, y = 0.093, z = 0.034 were determined from Patterson projections and improved by three-dimensional Fourier synthesis. The complete crystal structure determination is now in progress. (auth)

45638 PREPARATION OF ANHYDROUS FLUORIDES OF RARE-EARTH ELEMENTS. Li, Chun-Chiu. Hua Hsueh Tung Pao, No. 7, 27-33(July 1966). (In Chinese).

A survey was made of the subject, based primarily on Western literature. The material is presented under the following subheadings: fundamental principle of preparation of anhydrous fluorides of rare earth elements; methods of preparation of anhydrous fluorides of rare earth elements such as fluorination by hydrogen fluoride, fluorine gas, ammonium hydrogen fluoride, and precipitation with hydrofluoric acid; purification of fluorides of rare earth elements; and conclusion. (JPRS)

45639 PHASE EQUILIBRIA IN THE YTTERBIUM OXIDE–ALUMINA SYSTEM AND THEIR COMPARISON WITH EQUILIBRIA IN OTHER Ln_2O_3–Al_2O_3 SYSTEMS. Bondar, I. A.; Toropov, N. A. (Inst. of Silicate Chemistry, Academy of Sciences, USSR). Izv. Akad. Nauk SSSR, Ser. Khim., No. 2, 212-18(1966). (In Russian).

Phase diagrams were constructed for the $Yb_2O_3 - Al_2O_3$ and $Sm_2O_3 - Al_2O_3$ systems. X-ray studies confirmed the compounds $2Yb_2O_3 \cdot Al_2O_3$ and $3Yb_2O_3 \cdot 5Al_2O_3$. The physical properties of the La, Er, Sm, Y, Tb, and Yb aluminates were compared. The infusibility, hardness, density and chemical resistance of the rare earth aluminates helps make them suitable for high frequency ceramics, luminophores, materials for absorption of neutrons and protection against gamma radiation, and materials resistant to high temperature and aggressive media. (ATD)

45640 EFFECT OF GAS MEDIUM AND TEMPERATURE ON THE REACTIONS IN THE Ce–Ti–O SYSTEM AND THE COMPARISON OF PROPERTIES OF SOME RARE-EARTH TITANATES. Leonov, A. I.; Piryutko, M. M.; Keler, E. K. (Grebenshchikov Inst. of Chemistry of Silicates, Academy of Sciences, USSR). Izv. Akad. Nauk SSSR, Ser. Khim., No. 5, 787-92(1966). (In Russian).

Reactions in a Ce–Ti–O system heated in air, argon, CO_2, H_2, and NH_3 were studied in the temperature range from room temperature to 1600°C. The new chemical compound $CeO_{1.8} \cdot 2\ TiO_2$, synthesized in argon and CO_2, and another, with perovskite type structure, $(Ce_2O_3)_{1\pm x}$ $3\ TiO_{2-y}$, synthesized in hydrogen and NH_3, have the tendency to disintegrate when heated in air. Studies of the

effects of the gaseous medium on reactions in the La–Ti–O, Nd–Ti–O, Sm–Ti–O, and Y–Ti–O systems showed that in oxidizing and neutral media lanthanum and neodymium formed pyrochlore-type compounds, $La_2(Nd_2)Ti_2O_7$, and in a reducing medium perovskite-type compounds, $(Ln_2O_3)_{1\pm x} \cdot 3\ TiO_{2-y}$. Samarium and yttrium formed only pyrochlore-type compounds, $Sm_2(Y_2)Ti_2O_7$, which were stable in oxidizing and reducing media. (R.V.J.)

45641 STERIC EFFECT IN THE PLATINUM-CATALYZED EXCHANGE REACTION BETWEEN AROMATIC RING PROTONS AND DEUTERIUM OXIDE. Fraser, Robert R.; Renaud, Roger N. (Univ. of Ottawa, Can.). J. Amer. Chem. Soc., 88: 4365-70(Oct. 5, 1966).

The relative rates of the platinum-catalyzed exchange of heavy water with the ortho, meta, and para protons in several monosubstituted benzenes were determined. A very large steric effect but no detectable electronic effect was observed. These results are interpreted as support for the dissociative mechanism of exchange. (auth)

45642 DEUTERIUM ISOTOPE EFFECTS IN THE PHOTOCHEMISTRY OF 2-HEXANONE. Coulson, D. Robert; Yang, N. C. (Univ. of Chicago). J. Amer. Chem. Soc., 88: 4511-13(Oct. 5, 1966).

The photochemistry of 2-hexanone, 2-hexanone-5-d, 2-hexanone-5,5-d_2, and 2-hexanone-d_{12} was studied. Although results suggested that a γ hydrogen is considerably more reactive than a γ deuterium in the type II process of 2-hexanone, it was found that 5-deuterio-2-hexanones are photochemically more reactive than 2-hexanone. While the quantum yields from the $n \rightarrow \pi$ singlet state for all processes decreased with deuterium substitution at the 5 position, the quantum yields from the triplet state increased substantially with deuterium substitution. These results indicated that the triplet states of 5-deuterio-2-hexanone may have considerably longer lifetimes than 2-hexanone. Possible explanations for the increased quantum yields from the triplet states of 5-deuterio-2-hexanone are given. Investigation of 2-hexanone-d_{12} indicated that perdeuteration of 2-hexanone had no measurable increase in isotope effect over 2-hexanone-5,5-d_2. (D.H.M.)

45643 NEAR-INFRARED SPECTRA OF H_2O–D_2O SOLUTIONS. Worley, John D.; Klotz, Irving M. (Northwestern Univ., Evanston, Ill.). J. Chem. Phys., 45: 2868-71(Oct. 15, 1966).

Near-infrared spectra were obtained for HOD in D_2O solutions containing a variety of solutes. A sharp band occurs at 1.416 μ (7062 cm^{-1}) and other bands at 1.525 (6557 cm^{-1}), 1.556 (6427 cm^{-1}), and 1.666 μ (6002 cm^{-1}). The absorbances at 1.416 and 1.556 μ increase and decrease, respectively, with increasing temperature. From this variation, a ΔH^0 of formation of –2.4 kcal/mole was estimated for the O–H ... O bond in these solutions. Nineteen electrolytes and one polymer, polyvinylpyrrolidone, were examined for their effects on the spectra of water in this overtone region. No frequency shifts were observed with added solute, only changes in absorbance. Sodium perchlorate shows the strongest structure-breaking effect. Tetrabutylammonium bromide and polyvinylpyrrolidone exhibit structure-making character. A definite correlation was found to exist between the effects of salts on the aqueous solvent and their ability to affect the conformation of a macromolecule. (auth)

45644 ADIABATIC DISSOCIATION ENERGIES FOR THE GROUND STATES OF THE H_2, HD, AND D_2 MOLECULES. Hunter, G. (York Univ., Toronto). J. Chem. Phys., 45: 3022-8(Oct. 15, 1966).

Variational adiabatic potential curves for the ground state $X\ ^1\Sigma_g$ of these molecules were constructed from the adiabatic coupling corrections computed by Kołos and Wolniewicz. Energy eigenvalues of these variational potentials were computed. The derived dissociation energies are still larger than those inferred from the spectra of the molecules. It is suggested that the resolution of this discrepancy is more likely to be found in a reinterpretation of the experimental data than through any refinement of theoretical calculations. (auth)

45645 ANALYSIS OF THE ν_1 AND ν_2 FUNDAMENTALS IN DEUTERIUM SULFIDE. Miller, R. E.; Eggers, D. F. Jr. (Univ. of Washington, Seattle). J. Chem. Phys., 45: 3028-37(Oct. 15, 1966).

The fundamental infrared spectra of gaseous deuterium sulfide were measured with several grating instruments. The spectra were analyzed, with the aid of computer programs, to give rotational constants and band centers. For the latter ν_1 = 1896.38 and ν_2 = 855.5 cm^{-1} were found; very little evidence of ν_3 was detected. Both bands show a strong intensity anomaly, similar to that of hydrogen sulfide; a classical centrifugal distortion theory, previously applied to it, accounts for the anomaly in deuterium sulfide also. The effect of centrifugal distortion on the energy levels was computed by the Kivelson-Wilson method. (auth)

45646 FAR-INFRARED SPECTRUM AND HINDERING POTENTIAL OF DEUTERIUM PEROXIDE. Hunt, Robert H. (Florida State Univ., Tallahassee); Leacock, Robert A. J. Chem. Phys., 45: 3141-7(Oct. 15, 1966).

The hindered-rotation motion in the deuterium peroxide molecule is investigated through a study of the far-infrared absorption of the vapor. A 1-m focal-length vacuum grating spectrometer was used to scan the region from 20 to 400 cm^{-1} with an average resolution of 0.4 cm^{-1}. Seven perpendicular-type hindered-rotation bands characterized by prominent Q branches and unresolved P- and R-branch structure are observed in the spectrum. The band centers are located at 1.88, 42.3, 123.5, 136.8, 206.7, 250.9, and 302.6 cm^{-1}. From these it is determined that, relative to the ground state, the first five excited hindered-rotation states are at 1.88, 208.6, 250.9, 387.7, and 511.2 cm^{-1}. A theory of internal rotation, developed for an earlier application to the far-infrared spectrum of hydrogen peroxide, is applied to the D_2O_2 spectrum. In this theory the only internal degree of freedom is the dihedral angle x defining the relative position of the two OD groups. The Hamiltonian is put in the form H (asymmetric top) + H (internal rotation), where the inertial coefficients are functions of the internal angle x. A three-parameter hindering potential is assumed, $V(x) = V_1 \cos x + V_2 \cos 2x + V_3 \cos 3x$ and the internal-rotation wave equation is solved numerically by computer to obtain the potential parameters that reproduce the internal-rotation energy eigenvalues. In the semirigid model adopted, the effective hindering potentials, bond lengths, and bond angles of H_2O_2 and D_2O_2 differ slightly. The data do not yield a complete set of effective bond lengths and angles for D_2O_2, but the product of the OD distance and the sine of the OOD angle is found to be 0.01 Å smaller than its H_2O_2 counterpart. As a result, the inertial parameter in the internal-rotation wave equation is 2% larger than is predicted from the H_2O_2 data. When this adjusted inertial parameter is used, the hindering potential $V(x) = 994 \cos x + 641 \cos 2x + 55 \cos 3x$ provides a good fit to the D_2O_2 data. For this potential function the cis and trans potential barrier heights are 2470 and 377 cm^{-1}, respectively, and the potential minima are 110.8° from the cis configuration. These parameter values are similar to the corresponding H_2O_2 values of 2460 cm^{-1}, 386 cm^{-1}, and 111.5°. (auth)

45647 THE SOLUBILITIES OF MgO AND UO_2 IN MOLTEN MgF_2. Tomlinson, J. W.; Welch, B. J. (Imperial Coll. of Science and Tech., London). J. Inorg. Nucl. Chem., 28: 2131-6(Oct. 1966).

Liquidus curves were determined over a limited composition range for the systems MgO–MgF_2 and UO_2–MgF_2. Pure MgF_2 was observed to melt at 1260 ± 0.5°C and the system MgO–MgF_2 forms a simple eutectic containing 8.35 mole % MgO and melting at 1229.5°C. The saturation solubility for UO_2 in MgF_2 was determined for the temperatures from 1268 to 1434°C. The calculated partial molar heat of solution of the UO_2 in MgF_2 is +28.0 kcal $mole^{-1}$ and the eutectic is estimated to be at 0.35 mole % UO_2 and 1256°C. A technique is described for the estimation of

true liquidus temperatures for samples that exhibit random supercooling. (auth)

45648 PHASE RELATIONSHIPS FOR COMPOSITIONS BETWEEN Gd : Se = 1 : 1.6 AND Gd : Se = 1 : 2.0 Veale, C. R.; Barrett, M. F. (National Physical Lab., Teddington, Eng. National Chemical Lab., Teddington, Eng.). J. Inorg. Nucl. Chem., 28: 2161-5(Oct. 1966).

Vapor pressures of selenium were measured over compositions between Se : Gd = 1.6 : 1 and Se : Gd = 2.0 : 1 using a radioactive dew-point method. Isotherms at 943, 1000, and 1075°K showed the existence of a gadolinium polyselenide phase of variable composition between Se : Gd = 1.775 : 1 and Se : Gd = 1.862 : 1. X ray powder diffraction patterns showed a slight but definite increase in the size of the unit cell with increasing selenium content. (auth)

45649 SOLVOLYTIC DISPROPORTIONATION OF NONSTOICHIOMETRIC OXIDES OF PRASEODYMIUM AND TERBIUM. Sastry, R. L. N. (Indian Inst. of Science, Bangalore, India); Mehrotra, P. N.; Rao, C. N. R. J. Inorg. Nucl. Chem., 28: 2167-73(Oct. 1966).

The solvolytic disproportionation of nonstoichiometric PrO_x and TbO_x in acid solutions to produce higher oxides was investigated. Some new nonstoichiometric phases were reported. Features of the nonstoichiometric rare earth oxides are discussed and the need for a satisfactory structural model pointed out. (auth)

45650 PREPARATION AND PROPERTIES OF A POLYNUCLEAR URANYL NITRATE. Woodhead, J. L.; Deane, A. M.; Fox, A. C.; Fletcher, J. M. (Atomic Energy Research Establishment, Harwell, Eng.). J. Inorg. Nucl. Chem., 28: 2175-85(Oct. 1966).

A bright yellow salt, a component of certain mixtures crystallized from solutions of hydrolyzed uranyl nitrate, was isolated as the fraction that is insoluble in acetone. The dimensions of its triclinic unit cell were derived from x ray data. The composition and properties of the salt are interpreted in terms of it being the nitrate of a large +2 cation containing a hexagonal ring of six uranyl groups joined by twelve diol bridges, and on this basis the formula assigned to the salt is $[(UO_2)_6(OH)_{12}(H_2O)_{12}H_2](NO_3)_2 \cdot xH_2O$, where x is ca. 6. The components of the mixture formed by loss of water at 70°C were examined, and the disproportionation reaction that occurs slowly in aqueous solution was studied. (auth)

45651 COMPLEXES OF QUADRIVALENT TECHNETIUM. Fergusson, J. E.; Hickford, J. H. (Univ. of Canterbury, New Zealand). J. Inorg. Nucl. Chem., 28: 2293-6(Oct. 1966).

Complexes of technetium (IV) with triphenylphosphine, triphenylarsine, and α,α'-dipyridyl were isolated and studied. The experimental data is consistent with formation of the compounds as containing octahedrally coordinated technetium, $TcCl_4(Ph_3P)_2$, $TcCl_4(Ph_3As)_2$, $[TcCl_2(dipy)_2]Cl_2$, and $TcCl_4(dipy)$. Technetium (IV) was reduced to technetium (III) with (bisdiphenylphosphine) ethane and the tervalent complex $[TcCl_2(diphos)_2]Cl$ isolated. (auth)

45652 COMPLEX FORMATION BETWEEN GADOLINIUM IONS AND 5-SULFOSALICYLIC ACID. Thakur, N. V. (Atomic Energy Establishment, Trombay, India); Jogdeo, S. M.; Kanekar, C. R. J. Inorg. Nucl. Chem., 28: 2297-2305(Oct. 1966).

A quantitative study of the complex formation between gadolinium ions and 5-sulfosalicylic acid was carried out by potentiometry and spectrophotometry. The formation of 1 : 1 and 1 : 2 complexes was established. The data obtained favor the existence of a protonated complex of the type MHL formed from the ligand in equilibrium with the usual ML type complex. The stability constants of the complexes formed (ML, MHL, and ML_2) were determined at 20°C at constant ionic strength (0.1M). (auth)

45653 INFRA-RED STUDIES ON QUATERNARY AMMONIUM NITRATES AND THEIR Th(IV) NITRATE COMPLEXES IN ORGANIC DILUENTS. Bac, R. (Institutt for Atomenergi, Kjeller, Norway). J. Inorg. Nucl. Chem., 28: 2335-41(Oct. 1966).

Infrared spectra of the quaternary ammonium nitrates (Q's): trilaurylmethylammonium nitrate (TLMA), trilaurylethylammonium nitrate (TLEA), trioctylpropylammonium nitrate (TOPA), and hexadecyldimethylbenzylammonium nitrate (HDDMBA) in KBr and different solvents were studied. Solutions of Q in benzene and octanol-modified dodecane were saturated with $Th(NO_3)_4$ and information was obtained on the nature of nitrate in the thorium–hexanitrato–ammonium complex in either homogeneous or light and heavy organic metal loaded phases. (auth)

45654 IDENTIFICATION OF THE TARTARIC ACID OXIDATION PRODUCTS IN THE TARTARIC ACID ACCELERATED REACTION BETWEEN URANIUM(IV) AND THALLIUM(III). Grimley, J. McAdams; Brubaker, C. H. Jr. (Michigan State Univ., East Lansing). Contract AT(11-1)-1001. J. Inorg. Nucl. Chem., 28: 2395-8 (Oct. 1966). (COO–1001-8).

When tartaric acid is oxidized by thallium (III) in the presence of uranium (IV), it is converted to glyoxal ($C_2H_2O_2$) and carbon dioxide. If sufficient thallium (III) is present all of the tartaric acid is oxidized. In the absence of uranium (IV) tartaric acid is oxidized only very slowly, but in the presence of uranium (IV) its oxidation rate is comparable to the rate of oxidation of uranium (IV) itself. It appears that U(IV)–tartaric acid complexes form, which facilitate both the oxidation of tartaric acid and uranium (IV). (auth)

45655 EVIDENCE FOR A CHROMIUM(III)–CERIUM(III)–CITRATE COMPLEX. Schulz, W. W.; Mendel, J. E.; Phillips, J. F. Jr. (Battelle-Northwest, Richland, Wash.). J. Inorg. Nucl. Chem., 28: 2399-2403(Oct. 1966).

A complex with the approximate empirical formula $CrCeCit_2$(Cit = citrate) was identified by solvent extraction techniques. The bis(2-ethylhexyl) ester of phosphoric acid (HDEHP) was used as the extractant. The $CrCeCit_2$ complex gradually decomposed when the aqueous phase was kept in prolonged contact with the HDEHP phase. Detectable amounts of the complex were present after 4.5 hrs. (D.H.M.)

45656 SOLUBILITIES OF RARE EARTH IODATES. Firsching, F. H.; Paul, Thomas R. (Southern Illinois Univ., Edwardsville). J. Inorg. Nucl. Chem., 28: 2414-16(Oct. 1966).

The solubilities of the rare earth iodates (La, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Y) were determined by four different procedures. (D.H.M.)

45657 VANADIUM PENTAFLUORIDE COMPLEXES WITH XENON FLUORIDES. Moody, G. J.; Selig, H. (Argonne National Lab., Ill.). J. Inorg. Nucl. Chem., 28: 2429-30(Oct. 1966).

A study of the complexes formed by the vanadium pentafluoride reaction with xenon hexafluoride and with xenon tetrafluoride oxide was made. The physical properties and infrared spectra of the complexes $2XeF_6 \cdot VF_5$ and $2XeOF_4 \cdot VF_5$ are given. Ten of the eighteen known Xe(VI) complexes were examined for overall hydrolysate patterns, and like XeF_6, were found to react with 100% xenon retention. (D.H.M.)

45658 THERMOGRAVIMETRIC STUDY OF THE LIGHTER RARE EARTH ACETATES. Mayer, I.; Kassierer, F. (Hebrew Univ., Jerusalem). J. Inorg. Nucl. Chem., 28: 2430-2(Oct. 1966).

The products of the thermal decomposition of the acetates of La, Pr, Nd, Sm, Eu, and Gd were studied. The acetates were crystallized in two forms, monohydrates and hydrates with 3 to 5 molecules of water. Similar decomposition curves were found for the acetates of the different rare earth elements and also for acetates with varying numbers of water molecules. The anhydrous acetates showed a fairly broad range of stability. A distinct break in the decomposition curve was observed when the acetates of La, Pr, Nd, and Sm began to decompose, but the acetates of Eu and Gd gave more continuous curves indicating

that decomposition of the anhydrous acetate commenced at an early stage. The basic carbonates ($Ln_2O_2 \cdot CO_3$) were stable between 350 and 750°C; their stability decreased with increased atomic weights. (D.H.M.)

45659 TERBIUM METAL PREPARED FROM FLUORIDE PRECIPITATED OUT OF ALCOHOL. Moses, G. Q.; Ryan, V. A. (Univ. of Wyoming, Laramie). J. Inorg. Nucl. Chem., 28: 2452-4(Oct. 1966).

Ethyl alcohol was used as a solvent in the preparation of the fluoride used in the production of terbium metal. The study was made to see if less oxygen impurities were present when alcohol was used than when water was used as a solvent. The terbium obtained from the precipitation from acidic alcohol solutions was similar to that prepared from terbium fluoride precipitated from water. In a single metal sample 119 ppM of oxygen was found by ^{3}He activation analysis. Spectrographic analysis showed major cationic impurities in micrograms as follows: As < 0.5, Ca < 0.01, Cd < 0.5, Mg = 0.01, Pb < 0.1, Ba < 1, Re < 0.1, Ta < 0.5, Th < 0.1, W < 0.1, and Zn < 0.5. The total sample weight for analysis was 70 μg. An investigation of the possibility of volatile organic materials being adsorbed in the fluoride prepared in alcohol was not completed. (D.H.M.)

45660 MELTING POINTS OF CmF_3 AND AmF_3. Burnett, J. L. (Oak Ridge National Lab., Tenn.). J. Inorg. Nucl. Chem., 28: 2454-6(Oct. 1966).

The melting points of the trifluorides of curium-244 and americium-241 were determined. The average value for CmF_3 was 1406 ± 20°C and for AmF_3 was 1393 ± 20°C. (D.H.M.)

45661 PEROXIDES OF Am(III) AND THE OXIDATION OF Am(III) TO Am(IV) BY HYDROGEN PEROXIDE. Buijs, K.; Louwrier, K. P. (Transurane-Institut, Karlsruhe, Ger.). J. Inorg. Nucl. Chem., 28: 2463-4(Oct. 1966).

The nature of the brown americium compound formed in alkaline media in the presence of hydrogen peroxide was investigated. The preparation and properties of the compound, probably Am(III) hydroperoxide, are discussed. A convenient procedure for the quantitative preparation of Am(IV) hydroxide is given. (D.H.M.)

45662 SURFACE TENSION OF LIQUID URANIUM AND THORIUM TETRAFLUORIDES AND A DISCUSSION ON THE RELATIONSHIP BETWEEN THE SURFACE TENSION AND CRITICAL TEMPERATURE OF SALTS. Kirshenbaum, A. D.; Cahill, J. A. (Temple Univ., Philadelphia). J. Phys. Chem., 70: 3037-41(Oct. 1966). (TID-22152).

The surface tension of liquid uranium and thorium tetrafluorides was measured by the maximum bubble pressure method. The salts were contained in molybdenum crucibles and pressure measurements were made with capillary-tipped molybdenum tubes. The surface tension of water and liquid sodium chloride was satisfactorily measured prior to measuring the fluorides. The probable error of the values obtained is ±5 dynes/cm. Approximately 25 surface tension measurements were made on each salt and the least-mean-square equations fitting the data are σ_{UF_4} (dynes/cm) = $447 - 19.2 \times 10^{-2}T$ (°K) and σ_{ThF_4} (dynes/cm) = $461 - 16.12 \times 10^{-2}T$ (°K). The surface tension-temperature functions of salts, metals, and homopolar substances are discussed in relation to their behavior near the critical temperature. (auth)

45663 TORSION EFFUSION STUDY OF THE REACTION OF GRAPHITE WITH HAFNIUM AND URANIUM DIOXIDES. Pillay, T. C. M.; Gregory, N. W. (Univ. of Washington, Seattle). J. Phys. Chem., 70: 3140-5(Oct. 1966).

Steady-state CO pressures above mixtures of graphite with UO_2 and with HfO_2, respectively, in effusion cells were measured in the vicinity of 1600°K. An equilibrium-like behavior was observed, but the associated thermodynamic constants indicated that the controlling reactions are not those involving actual equilibration of graphite and the starting oxides. Various possible reactions, which might be expected to give rise to equilibrium CO pressures of the magnitude observed, are discussed. (auth)

45664 THE ($^3P_1$) MERCURY-PHOTOSENSITIZED DECOMPOSITION OF MONOGERMANE. Rousseau, Yves; Mains, Gilbert J. (Carnegie Inst. of Tech., Pittsburgh). J. Phys. Chem., 70: 3158-62(Oct. 1966).

The Hg6($^3P_1$)-photosensitized decomposition of GeH_4 appears to proceed by rupture of a Ge–H bond. Hydrogen, digermane, trigermane, tetragermane, and polymer were observed products. The H atoms formed in the primary process were not scavenged by 5% added propylene. The effect of added helium on the $(HD)/(H_2)$ ratio obtained from the photolysis of a $GeH_4 - C_2D_6$ system suggested the participation of "hot" hydrogen atoms in the reaction mechanism. (auth)

45665 SPECTROSCOPY AND FRANCK-CONDON FACTORS OF SCANDIUM FLUORIDE IN NEON MATRICES AT 4 DEG K. McLeod, Donald Jr.; Weltner, William Jr. (Union Carbide Research Inst., Tarrytown, N. Y.). J. Phys. Chem., 70: 3293-3300(Oct. 1966).

The absorption and emission spectra of ScF in neon matrices at 4°K were studied in the visible and near-infrared regions. The vapor that evolved from a mixture of solid Sc + ScF_3 at 1700°K was superheated to 2400°K before being trapped in the neon matrix to obtain a sufficient concentration of ScF molecules. Comparison of the matrix absorption spectrum with analysis of the gas spectra by Barrow, et al., showed that only transitions from the lowest $^1\Sigma^+$ state occur at 4°K, the ground state. Gradual small shifts of the visible spectrum of ScF in the matrix when exposed to tungsten light (reversed on warming) indicated that new metastable sites are formed in the neon lattice. Ratios of Franck-Condon factors were derived from the relative intensities of the bands in two progressions of ScF in the matrix spectra ($E^1\Pi \leftarrow X^1\Sigma$ and $C^1\Sigma \leftarrow X^1\Sigma$). Values of Δr_e (the change in interatomic distance during excitation) derived from them were compared with gas data and agreed better than 7%. Five bands in the infrared were tentatively assigned to the ScF_2 and ScF_3 molecules. (auth)

45666 STRUCTURAL STUDIES OF CHELATES BY ULTRASONIC WAVES. Prakash, Som; Prakash, Satya (Allahabad Univ., India). J. Phys. Chem., 70: 3325-9 (Oct. 1966).

Ultrasonic velocity and adiabatic compressibility lowering at three different temperatures were studied as a function of the composition for the systems zirconium(IV) – catechol – water, cadmium(II) – catechol – water, and thorium(IV) – catechol – water. The position of the breaks in the velocity – composition and compressibility – composition curves indicated the point of maximum chelate formation. In the first and second systems 1:1 chelates were formed. In the third system, however, 1:1 and 1:2 chelates were formed. (auth)

45667 STUDIES ON THE REACTION MECHANISM OF HIGH CERIUM SALT OXIDATION AND REDUCTION SYSTEM. Feng, Hsin-te; Ch'iu, K'un-yuan (Peking Univ.). K'o Hsueh T'ung Pao, 17: 407-9(May 1966). (In Chinese).

High cerium salt and organic reduction agents such as alcohols, aldehydes, ketones, and amines can form oxidation-reduction systems, which can easily induce polymerization of ethylenes. The effect of the oxidation and reduction systems composed of ammonium cerous nitrate and monohydric alcohols, monobasic ketones, poly-basic ketones and benzoin on the polymerization of acrylonitrile solutions are reported. These oxidation-reduction systems and their reaction mechanisms are discussed separately. (auth)

45668 STUDIES ON THE RARE EARTH SESQUIOXIDES–BERYLLIUM OXIDE SYSTEMS. PART II. THE ACTIVITY OF BERYLLIUM OXIDE AND THE STRUCTURAL MODEL OF BeO-RICH MELTS (0-40 MOL PERCENT $LaO_{1.5}$) IN THE La_2O_3–BeO SYSTEM. Kuo, Chu-k'un; Yen, Tung-sheng (Silicate Chemistry and Technol-

ogy Inst., Academy of Sciences, China). Kuei Suan Yen Hsueh Pao, 4: 145-51(1965). (In Chinese).

The activity of BeO was calculated from liquidus temperature measurements of the binary system La_2O_3–BeO in the range from 0 to 40 mole % $LaO_{1.5}$. The activity values thus calculated were much lower than those obtained from several possible structural models of the melt. A structural model of the chemical reaction is proposed that would better explain the change of activity of BeO in the melts studied. From this structural model it can be shown that two types of polyacidic ions may be present in the melt and that they exist in equilibrium with BeO as indicated in the following equation: $2Be_2O_3^{6-} + 2BeO \rightleftharpoons 3Be_2O_4^{6-}$. (JPRS)

45669 STUDIES ON THE SYSTEMS RARE EARTH SESQUIOXIDES–BERYLLIUM OXIDE. PART III. STABLE AND METASTABLE EQUILIBRIUM RELATIONSHIPS IN THE SYSTEM Gd_2O_3–BeO. Han, Wen-lung; Kuo, Chu-kun. Kuei Suan Yen Hsueh Pao, 4: 211-17(Nov. 1965). (In Chinese).

Phase relationships in the system Gd_2O_3–BeO were studied by the quenching method. It was shown that Gd_2O_3 and BeO form a simple binary system with the eutectic point at 53.4 mole % $GdO_{1.5}$ and a temperature 1472 ± 2°C. One metastable intermediate compound of $Gd_2O_3 \cdot 2BeO$ was found. Its lattice parameters (orthorhombic) and refractive indices were determined to be: a = 3.603 ± 0.003, b = 9.85 ± 0.03, and c = 10.51 ± 0.02Å and n_p = 1.89 and n_g = 1.94. The metastable behavior in this system was discussed. (JPRS)

45670 THEORETICAL INVESTIGATIONS OF FISSION PRODUCT DEPOSITION FROM FLOWING GAS STREAMS. Venerus, Ernest R.; Ozisik, M. Necati. Nucl. Sci. Eng., 26: 122-30(Sept. 1966).

Deposition of fission products from an isothermal laminar gas stream on the surfaces of a circular tube was investigated theoretically, for a source releasing a radioactive precursor into the gas stream at a uniform rate at the origin. A slug velocity profile is assumed. For solving the partial differential equations of the problem, two different models were examined as boundary conditions to couple the equations. The first model, which is referred to as the Resistance Model, is applicable when the surface concentration of the deposited precursor is small or removal of particles from the surface is negligible; and it is equivalent to assuming a fictitious unknown resistance to mass transfer at the wall surface. The boundary value problem of mass transfer based on the resistance model was solved for the transient conditions and analytical relations were derived for the concentration of fission products in the gas stream and on the tube surface. In the second model, which is referred to as the Transport Model, a more detailed account is taken of the actual physical transport process in the immediate vicinity of the conduit surface. The removal of precursor from the surface is related to the adsorption energy of the precursor and the temperature of the surface. Removal from the gas stream in the immediate vicinity of the conduit surface is described by a stream removal coefficient, which is obtained from the kinetic theory of gases. The boundary value problem based on the transport model was solved for the steady state condition only. The transport model was applied to experiments on deposition of radioactive isotopes from laminar gas streams and adsorption energies for some radioactive isotopes are determined. Correlation of the transport model with experiments provides a useful means for obtaining the adsorption energies of radioactive isotopes on metal surfaces. (auth)

45671 PREPARATION OF PURE BORON TRIFLUORIDE FOR USE IN IONIZATION RADIATION DETECTORS. Riedel, J. T. (Inst. for Nuclear Research, Warsaw). Przegl. Elektron., No. 3, 122-9(1966). (In Polish).

The purity requirements of BF_3 for use in proportional counters, the physical properties of BF_3 in the liquid and gaseous states, and the process of obtaining pure BF_3 using either of the two following chemical reactions $3CaF_2 + B_2O_3 + 3H_2SO_4 = 2BF_3 + 3CaSO_4 + 3H_2O$ or $6KBF_4 + B_2O_3 + 6H_2SO_4 = 6KHSO_4 + 8BF_3 + 3H_2O$ are discussed. The following are discussed and shown schematically: the apparatus for the production of pure BF_3 and its distillation, the apparatus for the production of $(C_2H_5)_2O.BF_3$; the apparatus for the production of $Ca(BF_4)_2$ and the apparatus for the production of BF_3 from $Ca(BF_4)_2$. The chemical reactions are discussed and their salient features are pointed out. An apparatus for thermal decomposition of the complex compound $Ca(BF_4)_2$ and the production of BF_3 by this method is discussed. A schematic of an apparatus for filling proportional counters with BF_3 obtained by thermal decomposition of $Ca(BF_4)_2$ is shown. (ATD)

45672 COMBUSTION OF ZIRCONIUM DROPLETS IGNITED BY FLASH HEATING. Nelson, L. S. (Sandia Lab., Albuquerque, N. Mex.). Pyrodynamics, 3: 121-34 (1965). (SC-R-65-1000).

A flash-heating technique, employing the intense thermal emission of a light pulse from a capacitor discharge lamp, was shown to be a promising way to study the combustion of even refractory metal droplets over a wide range of experimental conditions. In the combustion of Zr droplets, it was shown that nitrogen is an active participant when burning occurs in air, and that explosions occur as a result of cooling and partial solidification of the droplets. A mechanism is proposed to explain these explosions based on the release of a permanent gas into the still-molten interior as the exterior of the droplet begins to solidify. (auth)

45673 DOUBLE FLUORIDE OF PROTACTINIUM AND SILVER. Guillot, Ph. (Centre d'Etudes Nucleaires, Fontenay-aux-Roses, France). Radiochim. Acta, 5: 177-8(June 1966). (In French).

A double fluoride of Pa and Ag was produced by reacting protactinium oxide dissolved in hydrofluoric acid with a hydrofluoric acid solution of stoichiometric quantity of silver fluoride. After evaporation colorless crystals in the form of rods were obtained. The crystals were very soluble in hydrofluoric acid and methyl alcohol. They also dissolved in water but their dissolution was followed by the formation of a white cloud. They were insoluble in the majority of organic solvents. The crystals were analyzed; the Ag concentration was determined by iodide precipitation and the Pa concentration obtained by gravimetry of the Pa_2O_5. The results suggest the formula $AgPaF_6$. (J.S.R.)

45674 COMPOUNDS OF TRIVALENT PLUTONIUM, AMERICIUM, AND CURIUM WITH 8-HYDROXYQUINOLINE AND SOME OF ITS DERIVATIVES. Keller, C.; Eberle, S. H.; Mosdzelewski, K. (Technische Hochschule, Karlsruhe, Ger. Kernforschungszentrum, Karlsruhe, Ger.). Radiochim. Acta, 5: 185-8(July 1966). (In German).

Chelates Me (ligand)$_3$ of trivalent plutonium and americium with 8-hydroxyquinoline are obtained by precipitation from aqueous solutions. As the plutonium compound is very easily oxidized to Pu(IV), it can only be prepared in a completely oxygen-free medium. The properties of the oxinato-complexes of trivalent actinides are much like those of the analogous rare earth compounds. Solutions of the chelating agent in chloroform extract the compounds $Am(oxine)_2Y$, $Cm(oxine)_2Y$, and $Am(5,7\text{-dichloro-oxine})_3$ into the organic phase, Y probably being OH^-. The overall stability constant of $Am(5,7\text{-dichloro-oxine})_3$ is $\log \beta_3 = 21.93$ at T = 25.0 ± 0.5°C and μ = 0.1. (auth)

45675 ELECTRODEPOSITION OF NEPTUNIUM. Rajagopalan, M.; Ramaniah, M. V. (Atomic Energy Establishment, Trombay, India). Radiochim. Acta, 5: 236(July 1966).

A study of the electrodeposition of neptunium showed that only tracer concentrations of the element could be electrodeposited quantitatively from aqueous media. Electrodeposition from isopropyl, ethyl, and butyl alcohols resulted in several hundred micrograms of neptunium on aluminum, platinum, and stainless steel cathodes. Ethanol, the best of the three alcohols tested, gave sources on platinum of 90% deposition up to a thickness of 700 $\mu g/cm^2$. (D.H.M.)

45676 THERMODYNAMICS OF U_3O_8 DISSOLUTION IN H_2SO_4. Solntsev, V. M.; Tolmachev, Yu. M. Radiokhimiya, 7: 719-22(1965). (In Russian).

Changes of the isobaric-isothermal potential were used for studying the mechanism involved in the dissolution of U_3O_8 in sulfuric acid. Thermodynamic considerations, in agreement with experimental results, indicated that the dissolution process based on undissociated H_2SO_4 does not yield a residue of U_2O_5. Using acid concentrations exceeding 14 M, the composition of the oxide is not affected but in dilute acid solutions U_2O_5 is formed. Only within the composition range corresponding to U_2O_5 to U_3O_8 was there an agreement between isobaric potentials and the experimental data. Even though thermodynamic considerations indicate that composition changes leading to the formation of UO_2 should occur when U_2O_5 is dissolved, no such changes were observed. It was assumed that composition changes in the solute in the thermodynamically favorable direction occur only within the limits of the homogeneous phase. Possibly because Fe_3O_4 does not possess a wide homogeneous range, that oxide is dissolved in sulfuric acid without any changes in its composition. (TTT)

45677 PRODUCTION OF URANIUM, THORIUM, AND PLUTONIUM AND THEIR COMPOUNDS. Barghusen, J. J.; Nelson, P. A. Reactor Fuel Process., 9: 177-83 (Summer 1966).

The gas-solid reaction process and the sol-gel process for the production of UO_2 are reviewed, as is the recently reported work on the oxidation behavior and sintering properties of UO_2. The use of U(IV) as a reductant for Pu(VI) to Pu(IV) in the production of Pu metal or its compounds from dilute nitric acid in the Purex solvent extraction process is suggested. Recently published work on the reduction and on the recovery of Pu from the nitrate solution by precipitation as the trifluoride is briefly reviewed. The process currently under investigation at Hanford for the production of metallic Pu using a chloride intermediate is discussed. Recent developments in the production of (U,Pu)C by the fluid-bed carburization of hydrided U–Pu alloy with hydrocarbon–hydrogen gas mixtures are presented. Considerable attention is given to the thermodynamic and reaction-rate evaluation publications relating to this process. Work on the production and properties of U and Pu mixed anion fuels for water-cooled thermal reactors is reviewed. (37 references). (B.L.M.)

45678 DYNAMIC POLARIZATION OF NUCLEI OF A SOLVENT IN DPPH IN ORGANIC LIQUIDS. Stepanov, A. P.; Matevosyan, R. O.; Kholevinskaya, L. V. (Ural Polytechnic Inst., Sverdlovsk, USSR). Teor. Eksp. Khim., 2: 371-5(May-June 1966). (In Russian).

The dynamic polarization of solvent nuclei in concentrated DPPH (diphenylpicrylhydrazyl) solutions was measured in weak magnetic fields of ~21 Oe. In proton-containing solutions, negative dynamic polarization was observed, corresponding to the dipole-dipole interaction of electron and nuclear spin. In hexafluorobenzene solutions, significant contributions of the scalar interactions to the relaxation of fluorine nuclei were detected. The temperature dependence of the dynamic polarization of the fluorine nuclei was investigated, and the activation energy of the molecular bonds of the hexafluorobenzene in solvate films of DPPH molecules was found to be 3.3 kcal/mol. (tr-auth)

45679 CHEMICAL LUMINESCENCE OF RARE EARTH ELEMENTS IN SULFURIC ACID. Kazakov, V. P.; Lapshin, A. I. (Inst. of Thermal Physics, Novosibirsk, USSR). Teor. Eksp. Khim., 2: 376-83(May-June 1966). (In Russian).

Solutions of rare earth oxides in sulfuric acid have chemical luminescence in the visible and ultraviolet range during reactions with the electrolytic products of H_2SO_4. Analysis of the extension curves showed that the process obeys the bimolecular law and its linear anamorphosis can be represented by $J^{-\frac{1}{2}}$ t coordinates. Possible mechanisms for the process were examined with consideration of the ion-radicals $S^*O_4^-$. A comparison was made with the known luminescent rare earth elements and a possible explanation is given for why certain rare earth elements do not luminesce. (tr-auth)

45680 SOLUBILITY OF COBALT COMPOUNDS IN BOILING WATER AT 185 ATMOSPHERES. Mingulina, E. I.; Martynova, O. I.; Reznikov, M. I. Tr. Moskov. Energ. Inst., No. 48, 227-36(1963). (In Russian).

Investigations were made of the solubility of cobalt compounds in boiling water in primary loops of nuclear power plants using boiling water as the coolant. The solubility of $Co(OH)_2$ in water boiling at 185 atm was studied. At pH 8.5 formation of the $Co(OA)_2$ precipitate began. The undissociated $Co(OH)_2$ molecules amounted to $\sim 5.5 \times 10^3$ mg Co/l. At pH 8.5 and a Cl^- content of 0.52 mg/l, the solid phase consists of basic cobalt salts. The solubility of the cobalt compounds is many times higher than the solubility of pure $Co(OH)_2$. (M.C.G.)

45681 REACTIONS OF THERMAL ENERGY IONS. PART 3. ION-MOLECULE REACTIONS IN H_2O AND D_2O. Thynne, J. C. J.; Harrison, A. G. (Univ. of Toronto). Trans. Faraday Soc., 62: 2468-75(Sept. 1966).

The formation of H_3O^+ in the high-pressure mass spectrum of H_2O and, similarly, the formation of D_3O^+ in D_2O are the result of the ion-molecule reactions, $H_2O^+ + H_2O \rightarrow H_3O^+ + OH$; $OH^+ + H_2O \rightarrow H_3O^+ + O$; $D_2O^+ + D_2O \rightarrow D_3O^+ + OD$; $OD^+ + D_2O \rightarrow D_3O^+ + O$. The thermal rate constants, measured directly by a pulsing technique, are $k_1 = 4.9_3 \times 10^{-10}$, $k_2 = 4.7_2 \times 10^{-10}$, $k_3 = 3.6_6 \times 10^{-10}$, and $k_4 = 2.2_5 \times 10^{-10}$, all in cm^3 $molecule^{-1}$ sec^{-1}. (auth)

45682 URANIUM + WATER REACTION. PART 1. KINETICS, PRODUCTS, AND MECHANISM. Baker, M. McD.; Less, L. N.; Orman, S. (Atomic Weapons Research Establishment, Aldermaston, Eng.). Trans. Faraday Soc., 62: 2513-24(Sept. 1966).

The effects of temperature, relative humidity, and pH on the rate of the reaction of uranium and water were studied. Linear rates of corrosion and hydrogen evolution were obtained at different temperatures and the derived activation energies varied from 12 to 17 kcal $mole^{-1}$ depending on the batch of uranium. Hydrogen had no effect on the reaction. The products of the reaction were investigated under varying conditions of temperature and relative humidity. Parallel studies were made of the uranium hydride water system. The data were consistent with an oxide product $UO_{2.06\pm0.02}$, containing 2 to 9% uranium hydride in a protected form. A reaction mechanism is proposed, involving OH^- ion diffusion and formation of uranium hydride as a partial intermediate. It is suggested that the rate-controlling step is diffusion of water through fine capillaries to the oxide surface. (auth)

45683 URANIUM + WATER REACTION. PART 2. EFFECT OF OXYGEN AND OTHER GASES. Baker, M. McD.; Less, L. N.; Orman, S. (Atomic Weapons Research Establishment, Aldermaston, Eng.). Trans. Faraday Soc., 62: 2525-30(Sept. 1966).

The rate and products of the uranium + water + oxygen reaction were studied. Oxygen reduced the corrosion rate 30 to 100-fold and was consumed during the reaction. The oxygen was converted to water and did not react directly with the uranium. Only traces of hydrogen were evolved except under condensation conditions. A mechanism for the reaction is suggested. Hydrogen, nitrogen, and carbon dioxide had little or no effect on the uranium + water reaction. (auth)

45684 PILOT PLANT PRODUCTION OF NUCLEAR GRADE ZIRCONIUM SPONGE FROM INDIAN ZIRCON. Subramanyam, R. B.; Sundaram, C. V. (Atomic Energy Establishment, Bombay). Trans. Indian Inst. Metals, 19: 9-20(Mar. 1966).

Pilot plant production of nuclear-grade zirconium sponge on one kilogram scale from Indian zircon is described. The flowsheet incorporates multiple recrystallization of double potassium fluorides for the removal of hafnium and other impurities from zirconium. The purified potassium zirconium fluoride is converted to zirconium dioxide, which is

chlorinated to produce zirconium tetrachloride. Magnesium reduction of the chloride followed by vacuum distillation gives zirconium metal conforming to nuclear specifications. Operating conditions for optimum yields and purities in the various steps of the flowsheet are presented. It was estimated that zirconium metal produced by the above process on a scale of 60 tons/year will cost Rs. 65 to 70 per kilogram. (auth)

45685 KINETICS OF THE CHLORINATION OF NIOBIUM PENTOXIDE WITH CHLORINE IN PRESENCE OF EXCESS OF GRAPHITE POWDER. Mehra, O. K.; Hussain, S. Zahed; Jena, P. K. Trans. Indian Inst. Metals., 19: 53-6(Mar. 1966).

Kinetics of the chlorination of niobium pentoxide pellets by chlorine in presence of excess of graphite powder, were studied. The effects of surface area of the pellet, temperature of chlorination, partial pressure and flow rate of chlorine, were investigated. The amount chlorinated was found to be directly proportional to the time of reaction and surface area of the pellet. The rate of chlorination was observed to be proportional to P_{Cl_2} and independent of the flow rate of chlorine in the range (100 to 400 cc/min) studied. The rates of chlorination at various temperatures (600 to 750°C) were determined and the activation energy was found to be 44 Kcal/mole. A mechanism for this chlorination process, based on absolute reaction rate theory, is proposed. (auth)

45686 PRODUCTION AND PROPERTIES OF RARE EARTH PHOSPHIDES. Samsonov, G. V.; Vereikina, L. L.; Endrzeevskaya, S. N.; Tikhonova, N. N. (Inst. of Problems in Material Studies, Academy of Sciences, Ukrainian SSR). Ukr. Khim. Zh., 32: 115-18(1966). (In Russian).

Preparation and physicochemical properties of rare earth phosphides were studied, and it was shown that the rare earth phosphides are formed by reactions of phosphine with the metals or oxides. Recommended temperatures for preparation of rare earth phosphides from oxides are: for NdP and SmP, 1300 to 1350°C; for LaP, 1200 to 1250°C; and from metals: for NdP, 1000 to 1100°C, and for SmP 900 to 950°C. The prepared phosphides were easily dissolved in water. (R.V.J.)

45687 INTERACTION BETWEEN THE OXIDES OF RARE-EARTH ELEMENTS AND BARIUM OXIDE. Lopato, L. M.; Yaremenko, Z. A.; Tresvyatskii, S. G. (Inst. of Problems in the Science of Materials, Academy of Sciences, Ukrainian SSR). Ukr. Khim. Zh., 32: 437-9(1966). (In Russian).

Compounds were synthesized from BaO and the following rare earth oxides in the yttrium subgroup: Y_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, and Lu_2O_3. Some of the physical and chemical properties of the resultant compounds were studied. Microstructural analysis and x ray powder diagrams were used for phase identification. The compounds have the following structural formulas: BaY_2O_4, $BaHo_2O_4$, $BaEr_2O_4$, $BaTm_2O_4$, $BaYb_2O_4$, and $BaLu_2O_4$. The melting points, indices of refraction, and birefringence of the compounds were tabulated. The optical properties of the barium compounds differed somewhat from those for compounds with strontium oxide, which were studied previously. The indices of refraction for the compounds lie within the limits of the refractive indices for the initial oxides, whereas the strontium compounds showed higher indices of refraction than the initial oxides. Compounds with barium oxide have low birefringence (0.005 to 0.01), while the analogous strontium compounds have a birefringence of 0.035. The melting points of the compounds lie within a range of 1980 to 2500°C, which is somewhat lower than those observed for the strontium compounds. (ATD)

45688 PHASE DIAGRAMS OF SYSTEMS OF HYDROGEN WITH TITANIUM, ZIRCONIUM, VANADIUM, AND NIOBIUM. Samsonov, G. V.; Antonova, M. M. (Inst. of Materials Science Problems, Academy of Sciences, Ukrainian SSR). Ukr. Khim. Zh., 32: 555-9(1966). (In Russian).

Phases of the systems titanium–hydrogen, zirconium–hydrogen, vanadium–hydrogen, and niobium–hydrogen with compositions ranging from no hydrogen to $TiH_{1.93}$, ZrH_2, $VH_{0.915}$, and NbH at room temperature were studied by x ray diffraction. The lower boundaries of the region of homogeneity of the β-phase were shifted in a regular manner toward a lower hydrogen content on passing from titanium to niobium; this corresponded to the increase in the filling of the d-subshell of the corresponding transition metals. A satisfactory agreement between x ray and pycnometric density values was found for the Zr–H and Nb–H systems; the discrepancy of these values in the Ti–H system was attributed to the fact that the hydrides studied were not in a state of equilibrium. (ATD)

45689 SELENIDES OF PRASEODYMIUM, NEODYMIUM, SAMARIUM, AND EUROPIUM. Obolonchik, V. A.; Mikhlina, T. M. (Inst. of Problems in Material Sciences, Academy of Sciences, Ukrainian SSR). Ukr. Khim. Zh., 32: 567-72(1966). (In Russian).

Polyselenides of praseodymium, neodymium, and samarium of the Me_2Se_4 type were prepared by reacting the respective metal oxides with hydrogen selenide at 750 to 800°C. Sesquiselenides of these metals were prepared by similar reactions at 1100 to 1200°C, or by thermal decomposition of the polyselenides in hydrogen or in an inert gas. The reaction of europium with hydrogen selenide at 1100°C yielded europium monoselenide (EuSe); europium selenides with a higher selenium content were not obtained. The preparative procedure of the selenides, their properties, their stability in various media, and the preparation of compacted selenide specimens are described. (ATD)

45690 TERNARY 1,10-PHENANTHROLINE- OR 2,2-DIPYRIDYLTHENOYL TRIFLUORACETONE COMPLEXES OF SCANDIUM. Kononenko, L. I.; Orlova, I. G.; Poluektov, N. S. (Inst. of General and Inorganic Chemistry, Odessa). Ukr. Khim. Zh., 32: 627-31(1966). (In Russian).

It was shown that scandium thenoyltrifluoroacetone is capable of combining with 1,10-phenanthroline or 2,2′-dipyridyl to form complex compounds containing both compounds. Ternary complexes of Sc with 1,10-phenanthroline, 2,2′-dipyridyl, and TTA were separated and analyzed for Sc, phenanthroline, dipyridyl, and TTA. The compounds are described by the following formulas: $ScPhenTTA_3$ and $ScDipTTA_3$. (R.V.J.)

45691 STABILITY OF HYDRIDES OF SOME TRANSITION METALS ON HEATING IN A VACUUM. Antonova, M. M. (Inst. of Problems of Material Studies, Academy of Sciences, Ukrainian SSR). Ukr. Khim. Zh., 32: 661-2 (1966). (In Russian).

Dissociation pressure of titanium, zirconium, niobium, and tantalum hydrides at a constant or nearly constant hydride composition ($TiH_{1.975}$, $ZrH_{1.95}$, $TaH_{0.74}$, $NbH_{0.95}$) was measured for use in thermodynamic and other calculations. The pressure was measured with a mercury manometer during both cooling and heating of the hydride. The dissociation pressure of titanium, zirconium, and niobium hydrides showed a marked temperature dependence in contrast to that of tantalum hydride. This was attributed to the fact that $TaH_{0.74}$ does not consist of a single phase, but may be a mixture of two phases, which, on heating, show a more complex temperature dependence on the dissociation pressure; this assumption was based on x ray structural data reported earlier. Measurements showed that titanium and zirconium hydrides were stable in a vacuum up to 400°C, and niobium and tantalum hydrides up to 300°C. This is in good agreement with the large acceptor capacity of Ti and Zr for hydrogen, and the resultant strength of the bonding forces, manifested in a stronger holding of hydrogen in the Ti and Zr lattice as compared to Nb and Ta. (ATD)

45692 THIOCYANATES OF SAMARIUM. Golub, A. M.; Borshch, A. N. Ukr. Khim. Zh., 32: 923-5(1966). (In Russian).

Studies were made of solubility and thermal stability of samarium thiocyanates prepared from ethanol solutions: $Sm(CNS)_3 \cdot 7C_4H_8O_2$, $Sm(CNS)_2ClO_4 \cdot 5C_4H_8O_2$, $KSm(CNS)_4 \cdot$

$4C_2H_5OH$, $RbSm(CNS)_4 \cdot 5C_2H_5OH$, and $CsSm(CNS)_4 \cdot 6C_2H_5OH$. It was shown that these complexes are easily soluble in water, alcohols, tributylphosphate, ethers, ketones, pyridine, and dioxane but are not soluble in carbon tetrachloride, chloroform, and benzene. During heating the salts lost the solvate alcohol; $KSm(CNS)_4 \cdot 4C_2H_5OH$ at 115°C, $RbSm(CNS)_4 \cdot 5C_2H_5OH$ at 95°C, and $CsSm(CNS)_4 \cdot 6C_2H_5OH$ at 90°C and disintegrated at 200 to 280°C, 250 to 380°C, and 350 to 440°C, respectively. (R.V.J.)

45693 THERMAL DECOMPOSITION OF NEODYMIUM AND PRASEODYMIUM CARBONATE. **Illner, Erich (VEB Carl Zeiss, Jena, Ger.). Z. Chem., 6: 190-1(May 1966). (In German).**

Thermogravimetric curves for the decomposition of the carbonates of Pr and Nd are given. The carbonates were prepared by dissolving the oxides in 10% HCl, neutralizing with NH_3, diluting, and precipitating the carbonates at room temperature with 1N $(NH_4)_2CO_3$. Curves were determined with a quartz torsion thermal balance in air; the heating rate was 2°C/min. The $Nd_2(CO_3)_3 \cdot 7H_2O$ is dehydrated between 40 and 160°C; the last traces are removed at 250°C at which point the decomposition of the carbonate begins. At 460°C an anhydrous basic carbonate, $Nd_2O_3 \cdot CO_2$ appears; at 500°C this decomposes and at 675°C is converted to the oxide, Nd_2O_3. The thermal decomposition curve of $Pr_2(CO_3)_3$ is similar to that of the Nd compound between 20 and 450°C, at which point the basic carbonate, $Pr_2O_3 \cdot CO_2$, is formed. This is stable to 480°C, when it begins to decompose, giving, finally, at 750°C Pr_6O_{11}. The anhydrous carbonates of Nd and Pr are not stable. (BBB)

45694 ABSORPTION SPECTRA OF PROTACTINIUM (IV) AND PROTACTINIUM(V) IN SULPHURIC ACID SOLUTIONS. **Myasoedov, B. F.; Miranda, K. F.; Myuksar, R. (Inst. of Radium, Paris. Vernadskii Inst. of Geochemistry and Analytical Chemistry, Moscow). Zh. Anal. Khim., 21: 1064-9(1966). (In Russian).**

A study was made of protactinium(V) and protactinium(IV) absorption spectra in sulfuric acid solutions at various concentrations of hydrogen and sulfate ions. It was established that Beer's law is obeyed for protactinium(V) solutions in 0.5 M H_2SO_4 and in 1.5 M H_2SO_4 + 0.5 M $(NH_4)_2SO_4$ at 220 nm, the molar extinction coefficient at this wave length is 7.7×10^3. The molar extinction coefficient is considerably larger for 6 M H_2SO_4. Absorption spectra of weakly acid solutions of protactinium(V), particularly at 290 nm, changed depending on the storing time of solutions and heating which, probably, can be explained by protactinium hydrolysis. It was established that protactinium (?) is rapidly (about 30 min) reduced to protactinium(IV) by liquid zinc amalgam in all the media studied in the absence of air. Absorption spectra of protactinium(IV) hardly changed depending on the concentration of hydrogen and sulfate ions. The molar extinction coefficient at 290 nm is 1.5×10^3. The rate of protactinium(IV) oxidation in sulfuric acid solutions in the absence of air is 1 to 2% a day. The rate is considerably increased under the action of ultraviolet light and heating. (auth)

45695 COMPOSITION AND THERMAL DISSOCIATION OF SCANDIUM HYDROXIDE. **Ambrozhii, M. N.; Dvornikova, L. M. (Saratov State Univ., USSR). Zh. Neorg. Khim., 11: 2153-5(Sept. 1966). (In Russian).**

The composition of freshly prepared scandium hydroxide and the thermal characteristics of the dissociation process were studied. An analysis of the products of thermal dissociation was made using the third component method. The process of scandium hydroxide dissociation followed the scheme: $Sc_2O_3 \cdot 4H_2O \rightarrow Sc_2O_3 \cdot 2H_2O \rightarrow Sc_2O_3 \cdot H_2O \rightarrow Sc_2O_3$. (R.V.J.)

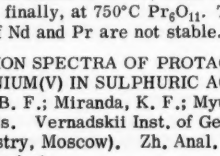
45696 THE $ErCl_3$–KCl SYSTEM. **Gavryuchenkov, F. G.; Novikov, G. I. Zh. Neorg. Khim., 11: 2172-4(Sept. 1966). (In Russian).**

Phase diagrams and thermal analysis of the $ErCl_3$–KCl system revealed that K_3ErCl_6 and $KCl \cdot 4ErCl_3$ form eutectics with a KCl content of 56 mole % and with melting point at 426°C. The K_3ErCl_6 and KCl compounds form eutectics with a KCl content of 87 mole % and melting point of 647°C, while K_3ErCl_6 melts at 808°C and $KCl \cdot 4ErCl_3$ melts incongruently at 547°C. (R.V.J.)

45697 THE Na_2SO_4–UO_2SO_4 SYSTEM. **Fedorov, P. I. Zh. Neorg. Khim., 11: 2176-8(Sept. 1966). (In Russian).**

Thermal analysis of an anhydrous binary system of sodium and uranyl sulfates revealed three compounds: the $2Na_2SO_4 \cdot UO_2SO_4$ or $Na_4UO_2(SO_4)_3$, melting congruently at 562°C with polymorphic transformation at 325°C; the $Na_2SO_4 \cdot UO_2SO_4$ or $Na_2UO_2(SO_4)_2$ dissociating at 568°C with polymorphic transformation at 495°C; and, the $Na_2SO_4 \cdot 3UO_2SO_4$ or $Na_2(UO_2)_3(SO_4)_4$ dissociating according to a peritectic reaction at 613°C. Complex sulfates analogous to the first two compounds were extracted from hydrous sodium and uranyl sulfates; however, among the extracted complexes no analog for the third compound was found. (R.V.J.)

45698 LUMINESCENCE SPECTRA OF EUROPIUM COMPLEXES WITH β-DIKETONE OF SELENOPHENE SERIES. **Lebedev, O. L.; Magdesieva, N. N.; Michurina, A. V.; Ainitdinov, Kh. A.; Yurev, Yu. K. (Moscow State Univ.). Zh. Strukt. Khim., 7: 521-5(July-Aug. 1966). (In Russian).**

Luminescence spectra of europium complexes with β-diketones of the selenophene series with the general formula  Eu showed that the strength of the chelate ring, molecular weight of additive, and, in a smaller degree, the symmetry influence the character of the spectrum. (R.V.J.)

45699 LONG WAVE SHIFT OF SPECTRAL BAND IN COMPLEX RARE EARTH COMPOUNDS. **Yatsimirskii, K. B.; Davidenko, N. K. (Inst. of General and Inorganic Chemistry, Academy of Sciences, Ukrainian SSR). Zh. Strukt. Khim., 7: 532-7(July-Aug. 1966). (In Russian).**

The maximum position of the $^3H_4 \rightarrow {}^3P_0$ transition band in praseodymium compound reflection spectra and of the $^4H_{\frac{5}{2}} \rightarrow {}^2P_{\frac{1}{2}}$ transition in neodymium compound spectra was determined. The nephelauxetic ligand series for rare earth elements were determined by the magnitudes of band transitions. The nephelauxetic effect in complex transition elements with unfilled d-shells was correlated with the shift of the maximum band transition $^3H_4 \rightarrow {}^3P_0$ in the praseodymium compounds with identical ligands. The correlation indicated the existence of covalent bands in the rare earth compounds. It is shown that the magnitude of the long wave band shifts depends not only on the number of the added groups but also on their structure. Thus, the nephelauxetic effect may be used for studying the internal structure of the compounds. (R.V.J.)

45700 SOLID-STATE CHEMISTRY OF BINARY METAL HYDRIDES. **Libowitz, George G. The Physical Inorganic Chemistry Series. New York, W. A. Benjamin, Inc., 1965. 149p.**

This book is divided into five chapters; the first three deal primarily with well-established information on preparative methods, chemical and thermodynamic properties, crystal structure, and phase relationships of the binary metal hydrides. The last two chapters deal with electric and magnetic properties and nonstoichiometry and lattice defects in the metal hydrides. Although all solid binary metal hydrides are covered in the book, particular emphasis is placed on the hydrides of the transition metals. (B.L.M.)

45701 LATTICE DISORDER IN SOME CaF_2 TYPE CRYSTALS. **Barsis, E.; Taylor, A. (Cornell Univ., Ithaca, N. Y.). 32p. (CONF-651062-10). ORAU. Gmelin, AED-CONF-65-325-23.**

From Metallurgical Society Fall Meeting, Detroit.

The ionic conductivity of BaF_2, SrF_2 and $SrCl_2$ single crystals doped with monovalent and trivalent cations was investigated from 300 to within 100°C of the melting tem-

perature. By correcting the intrinsic conductivity curve of SrF_2, a consistent trend in the slopes of the Arrhenius plots for the conductivity was obtained for these and other fluorides. Both the activation energy for conduction and the resistivity decreased with a decrease in the melting temperature of the materials. A Koch and Wagner type analysis of conductivity isotherms confirmed an anion Frenkel thermal disorder model for the fluorides. The type of disorder for $SrCl_2$ could not be determined unambiguously, however. Values for the energy of formation of the intrinsic defects and their motion energies were deduced from the slopes of the conductivity curves. Estimates of concentration of the thermal defects were made in each case. (auth)

Organic Chemistry

Refer also to abstract 45782.

45702 (UCRL–13222) SYNTHESIS AND EVALUATION OF COMPLEX POLYAMMONIUM HYDRIDES. [Research] Report, December 28, 1965–June 30, 1966. Smith, Harry F. (Thiokol Chemical Corp., Denville, N. J. Reaction Motors Div.). Contract W-7405-eng-48. 41p. (RMD–5084-F). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

For Lawrence Radiation Lab., Univ. of California, Livermore.

New, more efficient, and more economical processes have been developed for the synthesis of two quaternary ammonium halides which are precursors of borohydride salts of interest as neutron moderators. These processes involve the quaternization of diertiary amines, 1,4-dimethylpiperazine and 1,4-diazabicyclo[2.2.2]octane, with methyl chloride under pressure. The processes were scaled up to produce about one pound of 1,1,4,4-tetramethylpiperazinium dichloride (TMPDC) and 0.7 pound of 1,4-dimethyl-1,4-diaziniabicyclo[2.2.2]octane dichloride (DMPOC) per batch, in yields up to 98–99%. A six-pound supply of each of these chlorides was produced and delivered, for further exploration of the metathetical reactions by which the borohydrides are prepared. Alternate routes to these quaternary ammonium ions were discovered. Analogs of TMPDC and DDBOC were prepared by the reaction of ethylene bromide with tetramethylethylenediamine and 1,4-dimethylpiperazine, respectively. This process could presumably be adapted to utilize ethylene chloride if desired. Three potential synthesis routes leading to poly(ethylenedimethylammonium halides) were explored in detail. (P.C.H.)

45703 ISOTOPIC EFFECT OF DEUTERIUM ON THE SPEED OF ORGANIC REACTIONS: HYDROLYSIS OF ALPHA-DEUTERATED CYCLIC ACETALS. Guinot, Francois; Lamaty, Gerard (Ecole National Superieure de Chimie, Montpellier, France). Compt. Rend., Ser. C, 263: 549-52(Aug. 17, 1966). (In French).

The cyclic acetals of the following ketones were prepared: acetone, cyclopentanone, cyclohexanone, cycloheptanone, and cis-octahydro-2(1H)-naphthalenone (cis-decalone-2). Their rates of hydrolysis were measured in water–dioxane (40%–60% by volume). The isotopic effects are 1.137, 1.157, 1.123, 1.071, and 1.100, respectively. The origin of these effects is discussed in relation to the structure and the transition state. (tr-auth)

45704 DEUTERIUM SCRAMBLING DURING STEREOCHEMICAL EQUILIBRATION OF ENDO- AND EXO-NORBORNANOL-3,3-d_2. Humski, K.; Borcic, S.; Sunko, D. E. (Inst. Ruder Boskovic, Zagreb). Croat. Chem. Acta, 38: 55-6(1966).

Deuterium scrambling in the preparation of exo-Norbornanol-3,3-d_2 from the endo-isomer is reported. endo-Norbornanol-3,3-d_2, prepared by $LiAlH_4$ reduction of norcamphor-3,3-d_2 and containing 1.41 deuterium atoms per molecule, was refluxed in toluene, fluorenone, and sodium for 60 hr. The NMR spectrum of the product mixture revealed the presence of only 0.9 deuterium atoms per molecule bound to carbon. A series of reversible steps, oxidation, enolization, and hydroxyl deuterium exchange are postulated to account for observations. (auth)

45705 REFINEMENT OF INDUSTRIAL PRODUCTS BY SUBSTITUTING HYDROGEN BY DEUTERIUM. PART I. Muehlenfordt, J. (Institut fuer Stabile Isotope, Leipzig. Deutschen Akademie der Wissenschaften, Berlin). Isotopenpraxis, 2: 119-21(Mar. 1966). (In German).

The utilization of chemical-kinetic isotope effects of hydrogen for the increase of the resistance of chemical and pharmaceutical products to processes unfavorably acting on them as autoxidation, oxidation, hydrolysis, etc. is discussed. The economic and technological advantages of this method are demonstrated by the example of a deuterated clock oil. (auth)

45706 REFINEMENT OF INDUSTRIAL PRODUCTS BY SUBSTITUTING HYDROGEN BY DEUTERIUM. PART III. KINETIC ISOTOPE EFFECTS OF HYDROGEN IN AUTOXIDATION OF DIBENZYLSUCCINATE AS A MODEL SUBSTANCE OF A LUBRICANT. Krumbiegel, P.; Huebner, H.; Wahren, M. (Institut fuer Stabile Iosope, Leipzig. Deutschen Akademie der Wissenschaften, Berlin). Isotopenpraxis, 2: 185-7(Apr. 1966). (In German).

The following isotopic-isomeric dibenzylsuccinates were prepared: $C_6H_5CH_2-OOCCH_2CH_2COO-CH_2C_6H_5$, (I); $C_6H_5CD_2-OOCCH_2CH_2CH_2COO-CD_2C_6H_5$, (II); $C_6H_5CH_2-OOCCD_2CD_2COO-CH_2C_6H_5$, (III); and $C_6H_5CD_2-OOCCD_2CD_2COO-CD_2C_6H_5$, (IV). Isotope effects $k_I/k_{II} = 4.3 \pm 0.5$; $k_I/k_{III} = 1.0$; and $k_I/k_{IV} = 4.6 \pm 0.5$ of the autoxidation rates of these compounds were measured at 191°C in relation to the maximum rate. The maximum rates were not changed by the inhibitor phenyl-α-naphthylamine (0.1%). The induction periods of the compounds I and II, however, were changed quite differently. The inhibitor caused the induction period of compound II to be 40 times that of compound I. (auth)

45707 ELIMINATION REACTIONS OF α-HALOGENATED KETONES. XIII. SUBSTITUENT EFFECTS UPON THE KINETICS AND MECHANISM OF HALIDE ION PROMOTED DEHYDROBROMINATION OF DERIVATIVES OF 2-BENZYL-2-BROMO-1-INDANONE IN ACETONITRILE. Kevill, Dennis N.; Weiler, Ernest D.; Cromwell, Norman H. (Univ. of Nebraska, Lincoln). J. Amer. Chem. Soc., 88: 4489-94(Oct. 5, 1966).

The effect of para substituents within the aromatic ring of the benzyl group on the kinetics of the bimolecular halide-ion-promoted dehydrobromination of 2-benzyl-2-bromo-1-indanone was quite mild; the "averaged" Hammett ρ is positive but of much lower value than that previously found for alkoxide-promoted eliminations of various β-phenylethyl compounds in alcohols. Although the Hammett plots differ in character from those obtained in previous elimination studies, there are remarkably good correlations with Hammett plots based upon previous studies, in acetone, of iodide substitutions within various para-substituted β-phenylethyl chlorides and phenyl chloromethyl ketones. The low ρ values, coupled with low deuterium isotope effects and extreme sensitivity to the nature of the leaving group, give further support to the generally accepted view that in the transition states for suitable bimolecular eliminations carbon–halogen bond breaking is running considerably ahead of carbon–hydrogen bond breaking. As the Hammett σ value for the para substituent increases, so also does the rate of attack by chloride ion relative to that by bromide ion; at 60°C, the ratio rises from 16 for p-methoxy to 53 for p-nitro. Deuterium isotope effects previously reported for 2-benzyl-2-bromo-1-indanone were extended to the 3,3-dimethyl derivative. Seventeen new indanone derivatives were prepared and characterized. (auth)

45708 REVERSING INTRAMOLECULAR KINETIC CARBON ISOTOPE EFFECT IN THE GAS PHASE DECOMPOSITION OF OXALIC ACID. Lapidus, Gabriel; Barton, Donald; Yankwich, Peter E. (Univ. of Illinois, Urbana). J. Phys. Chem., 70: 3135-9(Oct. 1966). (COO–1142-66).

The intramolecular ^{13}C kinetic isotope effect was measured between 127 and 180°C in the decomposition to carbon dioxide and formic acid of oxalic acid-h_2 vapor at an initial pressure of 0.9 mm. This isotope effect, like that observed with oxalic acid-d_2, and like the intermolecular hydrogen isotope effect, is small and is so strongly temperature dependent that it inverts within the experimental range. The carbon isotope effect for the ordinary acid decomposition appears to be simple above 156°C. The similarity of the inversion temperatures of the carbon and hydrogen isotope effects lends support to the postulate that the inversion phenomenon arises in the accessibility to the reaction of more than one path, not in isotopic differential effects themselves. (auth)

45709 RATES OF HYDROGEN ABSTRACTION FROM METHANOL BY CF_3 RADICALS. Carlton, Terry S.; Steeper, J. Rodger; Christensen, Ronald L. (Oberlin Coll., Ohio). J. Phys. Chem., 70: 3222-5(Oct. 1966).

Hexafluoroazomethane was photolyzed in the presence of gaseous CH_3OH plus CD_3OD, CH_3OD plus CD_3OD, CH_4 plus CD_3OD and CD_3OH. From the relative rates of formation of CF_3H and CF_3D, rate constants and Arrhenius parameters were determined for abstraction by CF_3 radicals of the hydroxyl and alkyl hydrogens in CH_3OH. The activation energy for abstraction of each kind of hydrogen was 8.3 kcal/mole. The pre-exponential factor for alkyl hydrogen abstraction was 10 times the factor for hydroxyl hydrogen. The results were compared with those for abstraction from CH_3OH by CH_3 and CD_3 radicals. A dipolar model was used to explain trends in the relative activation energies for abstractions by CH_3 and CF_3. (auth)

45710 THERMAL POLYMERIZATION OF DEUTERATED STYRENES. Kirchner, K. (Dechema-Institut, Frankfurt am Main). Makromol. Chem., 96: 179-86(1966). (In German).

The following deuterated styrenes were prepared by standard procedures: α-deuterostyrene, β,β-dideuterostyrene, 2,4,6-trideuterostyrene, and p-deuterostyrene. Unlabeled styrene was prepared from aniline and from acetophenone. Tests in the absence of initiator were run 60 and 362 min at 127.3°C; viscosimetric results for the 60-min runs showed η for the compounds in their order above to be: 110.5, 115, 152, 109, 109, and 109 g/ml. Viscosimetric results for the 362-min runs gave η as: 157, 120, 156, 124.5, 123, and 126.5. Polymerization initiated at 49.3°C using 4.50×10^{-2}M azobisisobutyronitrile gave η equal to 59.1, 60.9, 57, 55.8, 56.5, and 55.2. The implications of the results for thermal polymerization are discussed in terms of direct interaction of the o-hydrogens with the reaction site in the initiation step. Results for induced polymerization are all the same within experimental error. (BBB)

45711 AN INFRARED STUDY OF ORGANOPHOSPHORUS COMPOUNDS. I. ROTATIONAL ISOMERS AND ASSIGNMENTS. Nyquist, R. A.; Muelder, W. W. (Dow Chemical Co., Midland, Mich.). Spectrochim. Acta, 22: 1563-9 (Sept. 1966).

Infrared liquid and solution spectra were recorded from 400 to 3800 cm^{-1} at temperatures from 25 to –100°C for $CH_3-O-P(=S)Cl_2$, $CD_3-O-P(=S)Cl_2$, and $CH_3-O-P(=O)Cl_2$. Study of infrared spectra at several temperatures added support to a previous conclusion that the absorption bands of $\nu_{P=O}$ and $\nu_{P=S}$ appear as doublets due to the existence of rotational isomers. The absorption bands of several fundamentals appeared as doublets in the infrared spectrum due to the presence of rotational isomers. The study of the infrared spectrum of $CD_3-O-P(=S)Cl_2$ enabled a definite assignment for the fundamentals due to CH_3- and CD_3-groups and the fundamentals for the $-C-O-PCl_2$ skeleton, which occur in the 400 to 3800 cm^{-1} region of the spectrum. (auth)

45712 CH BONDING MOMENTS AND IR INTENSITY OF BENZENE DERIVATIVES. II. CH AND CD STRETCHING VIBRATIONS OF DEUTERATED BENZENE MONODERIVATIVES. Schmid, E. D.; Langenbucher, F. (Univ., Freiburg i. B.). Spectrochim. Acta, 22: 1621-32(Sept. 1966). (In German).

The absorption intensities of the CH and CD stretching vibrations of some deuterated benzene monoderivatives were measured in CCl_4 solution. The compounds were of the type 4-D-phenyl-X and 2,4,6-D_3-phenyl-X. The observed intensities can be interpreted as sum of contributions I_0, I_m, and I_p of the participating CH or CD oscillators. By using the data for the undeuterated compounds phenyl-X these bond contributions can be evaluated separately. They showed a decrease with the Taft substituent parameter σ_I, that is greatest in ortho and smallest in para position. The isotope intensity sum rule was verified for the CH and CD stretching vibrations in all the cases considered. (auth)

45713 PROTOPHILIC DEUTEROEXCHANGE OF SOME ORGANOPHOSPHORUS (III) COMPOUNDS. Yakovleva, E. A.; Tsvetkov, E. N.; Lobanov, D. I.; Kabachnik, M. I.; Shatenshtein, A. I. (Karpov Inst. of Physical Chemistry, Moscow). Tetrahedron Lett., No. 35, 4161-6(Sept. 1966).

The rates of hydrogen-deuterium exchange of the following substances with 0.8N t-C_4H_9OK solution in equal volumes of diglyme ($CH_3OC_2H_4\overline{OCH_3}$) and deuterated t-butanol at 120°C or with 0.03N potassium amide in liquid ammonia at 0 or 25°C were measured: $C_6H_5P(CH_3)_2$, $(C_6H_5)_2PCH_3$, m-$CH_3C_6H_4P$ $(C_6H_5)_2$, p-$CH_3C_6H_4P(C_6H_5)_2$, $(C_6H_5)_3P$, m-$CH_3C_6H_4N(C_6H_5)_2$, p-$CH_3C_6H_4N(C_6H_5)_2$, and $(C_6H_5)_3N$. In $C_6H_5P(CH_3)_2$ 6 hydrogen atoms underwent exchange much more rapidly than the others. The rate constant of hydrogen exchange in the dimethylphosphino group with $ND_3 + KND_2$ (0.02N) was calculated to be $k = 1.1 \times 10^{-3}$ sec^{-1} at 0°C. Exchange took place twice as fast as in the CH_3 group of toluene and 120 times as fast as in benzene, while it was about 10^4 times faster than in the dimethylamino group. Such a considerable difference is ascribed to stabilization of the dimethylphenylphosphine carbanion in the transition state of the exchange reaction with the base due to 2p, 3d conjugation. If the constant for the rate of hydrogen exchange in the CH_3 group of toluene with a solution of potassium amide in ammonia is taken equal to unity, the following order is obtained: $CH_3 = 1$, $OCH_3 = 0.003$, $SCH_3 = 10000$, $N(CH_3)_2 = 0.0001$, $P(CH_3)_2 = 2$. Consequently the replacement of nitrogen by phosphorus will accelerate the exchange reaction by 10^4 fold, and the replacement of oxygen by sulfur will increase the rate by 10^7 times. (BBB)

Radiation Chemistry

See also BIOLOGY AND MEDICINE — Radiation Effects on Biochemicals Radiation Effects on Tissues

Refer also to abstracts 45289 and 46491.

45714 (ORNL–3945, pp 218-20) IRRADIATION EFFECTS ON HETEROGENEOUS SYSTEMS. (Oak Ridge National Lab., Tenn.).

The radiolysis of adsorbed water was studied using silica-alumina, alumina, and some molecular sieves as adsorbents. The $G(H_2)$ values were measured as a function of the electron fraction of sorbed water and were found to be greatly enhanced over those for liquid water, especially for the silica–alumina–water system. Surface acidity seemed to play a part in the efficiency of the adsorbent to sensitize or to transfer energy to the adsorbed water. (auth)

45715 (ORO–2418-1) INFRARED SPECTRA OF PLASTICS AND ELASTOMERS AFTER NUCLEAR IRRADIATION. Annual Progress Report. Sears, W. C. (Georgia Univ., Athens. Dept. of Physics). Sept. 12, 1966. Contract AT(40-1)-2418. 22p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Molar absorptivities and integrated absorption intensities for trans-vinylene, vinyl, vinylidene, and cis-trisubsti-

tuted ethylene groups were evaluated from polymers and olefin solutions in carbon tetrachloride exposed in the LITR. Trans-vinylene group concentrations in polyacrylonitrile, acrylonitrile-butadiene 45/55 copolymer, and an acrylonitrile-styrene 29/71 copolymer were calculated on the basis of molar absorptivities and integrated absorption intensities determined on noncrystalline standards. It was determined that the G values for trans-vinylene group formation in polyacrylonitrile, a 29/71% acrylonitrile-styrene copolymer, and a 45/55% acrylonitrile-butadiene copolymer were +0.15, −5.1, and 0.012, respectively. It was concluded that the styrene component confers a protective effect toward the acrylonitrile component in trans-vinylene growth. Likewise, it was concluded that the acrylonitrile component confers a protective effect toward destruction of trans-vinylene groups in the butadiene component. (P.C.H.)

45716 RADIATION-INDUCED POLYMERIZATION AT LOW TEMPERATURE. Oshima, Keichi; Tabata, Yoneho (Tokyo Univ.). Advances Nucl. Sci. Technol., 3: 267-327(1966).

Radical, ionic, and combined radical-ionic polymerizations in the liquid state are reviewed. Radioinduced polymerization in the liquid state is discussed. General aspects of solid-state polymerization, important factors affecting solid-state polymerization, solid-state polymerization at low temperature, and mechanisms of solid-state polymerization at low temperature are described. (M.C.G.)

45717 THE RADIATION RESISTANCE OF ANTHRACENE OILS. II. PILE RADIOLYSIS AT 150 DEG TO 380 DEG C. Proksch, E. (Reaktorzentrum, Seibersdorf, Austria). Atompraxis, 12: 406-9(Aug. 1966). (In German).

The radiolytic decomposition of anthracene oils in a nuclear reactor has been studied using two fast-neutron dose fractions. Extrapolation of the data from the two series of experiments shows that the decomposition caused by fast neutrons is higher by a factor of about 2.5 to 5 than by γ irradiation. For VÖEST-Anthracene Oil I the G-values for total decomposition and gas production are 0.22 ± 0.04 and 0.016 ± 0.010, respectively, both values being independent of temperature. The stability of different oils decreases with increasing fraction of non-aromatic portions. The dependence on dose of the decomposition follows a second-order rate law. The decomposition products range from dimeres to tetrameres of the original hydrocarbons. (auth)

45718 DISTRIBUTION OF ^{125}Sb FORMED IN TIN COMPOUNDS BY NEUTRON CAPTURE. Facetti, J. F.; Trabal, E.; Torres, S. (Centro Nuclear de Puerto Rico, Mayaguez). pp 43-4 of I Conferencia de Espectroscopia Nuclear y Fisica del Estado Solido. Lima, Organizacion de Universidade Catolicas de America Latina, 1964. (In Spanish).

The distribution of the chemical state of ^{125}Sb obtained by β^- decay of ^{125}Sn formed by neutron capture in SnO_2 and K_2SnO_3 was determined. The results are tabulated and are compared with those obtained for analogous systems. The yield of the pentavalent state of ^{125}Sb formed in SnO_2 is greater than that obtained for Sb_2O_4. The results obtained for K_2SnO_3 do not agree with those obtained for Na_2GeO_3. The reasons for the differences are discussed. (J.S.R.)

45719 INVESTIGATION OF THE INFLUENCE OF HEAT TREATMENT ON THE PHOTOELECTRIC PROPERTIES OF SILICON WITH RADIATION DAMAGES IN ITS STRUCTURE. Sevchenko, A. N.; Tkachev, V. D.; Lugakov, P. F.; Yukhnevich, A. V. (Belorussian State Univ., USSR). Dokl. Akad. Nauk BSSR, 10: 148-50(1966). (In Russian).

The purpose of the investigation was to study the temperature stability of different radiation damages produced in single-crystal silicon when irradiated. The initial material was p-type silicon with a resistivity of 7 to 10 ohm-cm, containing 3 to 8×10^{17} cm^{-3} oxygen. The irradiation was carried out with 1-Mev electrons from an electrostatic generator at 80°K and 30°C. The spectral dependence of the stationary photoconductivity was plotted. The results showed that samples whose photoconductivity spectrum displayed no structure shortly after the cessation of irradiation, acquired a pronounced structure after prolonged storage at liquid-nitrogen temperature. This was attributed to diffusion of vacancy pairs resulting from the electron bombardment. An increase in the temperature and longer storage following the bombardment caused the point defects due to the bombardment to become annealed. The results are interpreted and reconciled with the level scheme of the defects. A quantitative interpretation of the phenomenon was made difficult by the presence of different types of structure defects that can become transformed into each other during annealing. (ATD)

45720 SZILARD-CHALMERS EFFECT AND ITS APPLICATIONS. Wang, Lien-sheng. Hua Hsueh Tung Pao, No. 5, 8-13(May 1965). (In Chinese).

The Szilard-Chalmers effect due to recoil atoms is reviewed, with retention, comparative radiation, and condensation coefficient in non-carrier radioisotope condensation discussed. Its application was extended, since its discovery, from (n,γ) nuclear reactions to (n,p) and (n,α) nuclear reactions, and particularly to $^{14}N(n,p)^{14}C$ and $^{6}Li(n,\alpha)^{3}H$ nuclear reaction studies. One of the advantages is due to its comparative simplicity in experimental techniques. (JPRS)

45721 DETECTION OF THE TRAPPED ELECTRONS IN γ-IRRADIATED GLASS-FORM NEUTRAL AQUEOUS ELECTROLYTE SOLUTIONS BY EPR METHOD. Ershov, B. G.; Pikaev, A. K. (Inst. of Physical Chemistry, Academy of Sciences, USSR). Izv. Akad. Nauk SSSR, Ser. Khim., No. 2, 386(1966). (In Russian).

The EPR method was used for capturing electrons in frozen neutral solutions of 10M $NaClO_4$ and 10 to 15M LiCl in H_2O and D_2O. Gamma irradiation at −196° resulted in a violet color for $NaClO_4$ and blue for LiCl. The yield of captured electrons with reduced EPR signal was ~0.5 (at ~10^{19} ev/ml doses). (R.V.J.)

45722 STUDY OF IONIZED STATES IN THE IRRADIATED SOLID STATE SATURATED HYDROCARBONS. Yakovlev, B. S.; Frankevich, E. L. (Inst. of Chemical Physics, Academy of Sciences, USSR). Izv. Akad. Nauk SSSR, Ser. Khim., No. 3, 402-7(1966). (In Russian).

Photoconductivity in saturated hydrocarbons irradiated at low temperatures is associated with the freeing of electrons stabilized in traps, under the effect of light. Electron traps which apparently are alkyl radicals emerge in the radiolytic process in the substances studied. The spectral form of photoconductivity after irradiation with a dose of 0.3 megarads is determined by the electrons stabilized in the radicals. Thermostimulated conductivity of the irradiated saturated hydrocarbons is principally caused by movement of the positive charges. (JPRS)

45723 RADIOLYSIS OF DIETHYL ETHER. III. EFFECT OF TEMPERATURE ON THE VAPOR PHASE. Bansal, K. M.; Freeman, G. R. (Univ. of Alberta, Edmonton, Can.). J. Amer. Chem. Soc., 88: 4326-9(Oct. 5, 1966).

The γ radiolysis of diethyl ether vapor was studied over the temperature range from 33 to 220°C. At temperatures greater than 80°C acetaldehyde and ethane were formed mainly by a free-radical chain reaction. The activation energies of $CH_3CHOC_2H_5 \rightarrow CH_3CHO + C_2H_5$ and $C_2H_5 + C_2H_5OC_2H_5 \rightarrow C_2H_6 + CH_3CHOC_2H_5$ were found to be E_a = 19 kcal/mole and E_a = 9 kcal/mole. The main chain termination reaction in the temperature range 100 to 140°C was that of $CH_3CHOC_2H_5 + C_2H_5 \rightarrow CH_3\underset{\displaystyle C_2H_5}{\underset{|}{C}}HOC_2H_5$, whereas at higher temperatures the main termination reaction is that of $2C_2H_5 \rightarrow C_4H_{10}$. The disproportionation reaction occurred only to a small extent. At temperatures greater than 80°C the total primary yield of radicals is G (ether → R + R′) = 5.8. (auth)

45724 COMPARISON OF TENSILE STRESS RELAXATION BEHAVIOR OF GRAFT COPOLYMER OF POLY

(VINYL ACETATE) WITH STYRENE AND MECHANICAL MIXTURE OF POLY(VINYL ACETATE) WITH POLYSTYRENE. Soen, Toshiichi; Horino, Tzuneo; Ogawa, Yasuo; Kyuma, Koichi; Kawai, Hiromichi (Kyoto Univ.). J. Appl. Polymer Sci., 10: 1499-1517(Oct. 1966).

The tensile stress relaxation behavior of a graft copolymer of poly(vinyl acetate) with styrene, obtained by ^{60}Co γ-irradiation of poly(vinyl acetate) in styrene solution and extraction of homopolymers, was investigated as a function of the fraction of styrene component and compared with that of a mechanical mixture of poly(vinyl acetate) with polystyrene, one of the typical combinations of incompatible components. The results obtained may classify the graft copolymer as a sort of mechanical mixture giving stable mixing even for incompatible components. (auth)

45725 ESR STUDY OF IRRADIATED PYRIDINE. Tsuji, Kozo; Yoshida, Hiroshi; Hayashi, Koichiro (Kyoto Univ.). J. Chem. Phys., 45: 2894-7(Oct. 15, 1966).

Pyridine and pyridine-d_5 were irradiated with electrons in the solid state at −196°C. After the irradiation, ESR spectra were measured over a temperature range from −196°C to their melting points. For pyridine, a triplet spectrum (separation of 30 G) with a quartet substructure of 4.3 G) was observed at −196°C. It was assigned to cation radicals. The triplet spectrum disappeared at elevated temperatures and an eight-line spectrum (separation of 12 G) was observed at −90°C, which was assigned to free radicals. After the disappearance of these radicals at −65°C, a singlet spectrum (ΔH_{msl} of 15 G) was observed and disappeared at about −50°C. It was assigned to pyridyl radicals. The radicals produced in the irradiated pyridine-d_5 had the same nature as those observed in irradiated pyridine. (auth)

45726 CHEMICAL RESULTS OF NUCLEAR PROCESSES IN MIXED CRYSTALS. II. CHEMICAL RESULTS OF THE $^{190}Os(n,\gamma)^{191}Os$ NUCLEAR PROCESSES IN K_2OsBr_6-K_2SnCl_6 MIXED CRYSTALS. Mueller, Horst (Univ., Freiburg i. B.). J. Inorg. Nucl. Chem., 28: 2081-91(Oct. 1966). (In German).

All mixed hexa(chlorobromo)-csmates $^{191}OsCl_nBr_{6-n}^{2-}$ ($0 \le n \le 6$) were produced in mixed crystals K_2OsBr_6-K_2SnCl_6 by the nuclear process $^{190}Os(n,\gamma)^{191}Os$. The experimental results were analogous to those obtained during the investigation of the chemical effects of the nuclear reaction $^{185}Re(n,\gamma)^{186}Re$ in K_2ReBr_6-K_2SnCl_6 mixed crystals. They support the "disorder model" and the small value of ~5 Å for the recoil range and radius of the reaction zone in the case of heavy (n,γ) recoil atoms. (auth)

45727 THEORETICAL ANALYSIS OF RETENTION AND SPECIFIC ACTIVITY IN SZILARD-CHALMERS REACTION. PROPOSAL OF THE SECOND ORDER RATE LAW FOR RECOMBINATION OF THE RECOIL PRODUCTS. Matsuura, T. (Rikkyo Univ., Yokosuka, Japan). J. Inorg. Nucl. Chem., 28: 2093-2109(Oct. 1966).

The separable yield and specific activity obtained by the Szilard-Chalmers reaction, with or without pre- or post-gamma irradiation, were derived theoretically as a function of the reactor irradiation time and the subsequent dose of ionizing radiation, in terms of parameters denoting the decomposition rate of the parent species, recombination rate of the separable species and initial yield. Solutions were obtained for first order and second order recombination rates, and numerical values obtained by inserting appropriate values for the parameters. The second order rate law, proposed for the first time, is based on the assumption that the recoil and radiolysis give rise to the same products and these species can recombine into the parent material by the same mechanism. In order to test these theories, experiments on the effects of pre- and post-irradiation with ionizing radiation were made for $Co(NH_3)_6^{3+}$ and $Coen_3^{3+}$ ions adsorbed on ion-exchange resin, and it was shown that these data could be successfully interpreted by the second order rate law instead of the usual first order one. (auth)

45728 FORMATION OF ^{13}N, ^{17}F, AND ^{18}F IN REACTOR-IRRADIATED H_2O AND D_2O: APPLICATIONS TO ACTIVATION ANALYSIS AND FAST NEUTRON FLUX MONITORING. Hammar, Lennart; Forsen, Sture (Aktiebolaget Atomenergi, Stockholm). J. Inorg. Nucl. Chem., 28: 2111-23(Oct. 1966). (AE-170).

The equivalent macroscopic ^{235}U-fission neutron cross-sections with respect to formation of the following nuclei were measured and found to be: ^{13}N in H_2O, 13.5 ± 2; ^{13}N in D_2O, 0.24 ± 0.05; ^{17}F in D_2O, 3500 ± 700; ^{18}F in H_2O, 5.6 ± 0.9; and ^{18}F in D_2O, 4.1 ± 0.6 units of 10^{-10} cm^{-1}. The yield of ^{13}N in D_2O refers to D_2O containing no H, and the yield of ^{18}F in D_2O to an $^{17}O:^{16}O$ ratio of 0.0391 ± 0.0007. Good agreement was obtained in comparing the measured yields of ^{13}N and ^{18}F in H_2O with estimates based on calculations of the neutron-induced flux of knock-on protons and on published cross-section data for the reactions $^{16}O(p,\alpha)^{13}N$ and $^{18}O(p,n)^{18}F$. The similarly calculated yield of ^{17}F in D_2O due to the reaction $^{16}O(d,n)^{17}F$ was six times less than the observed yield. This discrepancy could not be eliminated by taking into account the anisotropy of the neutron scattering by deuterons. The formation of ^{18}F in D_2O was attributed to the reaction $^{17}O(d,n)^{18}F$. It is suggested that this reaction may be utilized to determine the $^{17}O:^{16}O$ ratio in heavy water by neutron activation analysis, as a means of differentiating between heavy water qualities obtained by different techniques of enrichment. The formation of ^{13}N in D_2O that cannot be attributed to the $^{16}O(p,\alpha)$ reaction due to residual H content, is suggested to be due to the reaction $^{16}O(d,n\alpha)^{13}N$, which was not previously reported. The cross section of this reaction per knock-on deuteron at energies above the estimated reaction threshold (8.4 Mev), corresponding to the yield of ^{13}N, is 8 ± 2 mbarn. Application of the $^{14}O(p,\alpha)^{13}N$ reaction for neutron activation analysis of H in D_2O may be possible, in spite of the observed extra yield of ^{13}N, down to 1 atom percent (H/D). The formation of ^{13}N and ^{18}F in H_2O and of ^{17}F in D_2O may advantageously be utilized for fast neutron flux monitoring in reactors. The possibility of application for neutron spectrum determinations is restricted by poor energy resolution. (auth)

45729 ULTRASONIC EFFECTS IN GAMMA-IRRADIATED INORGANIC SOLIDS. Khare, M.; Mohanty, S. R.; Nair, S. M. K. (Banaras Hindu Univ., India). J. Inorg. Nucl. Chem., 28: 2461-2(Oct. 1966).

The annealing of γ irradiation damage by ultrasonic radiations and of sonolytic damage by heat is reported. Lead nitrate and potassium bromate crystals were irradiated with ^{60}Co γ rays to a dose of 50 Mrad. Samples of the original and γ irradiated crystals were exposed for different time intervals to 500kc/s ultrasonic radiation in a paraffin bath at 30°C using a generator delivering 50W to the bath. Unirradiated crystals of lead nitrate did not undergo any apparent chemical damage on exposure to ultrasonic radiation for periods up to 2.5 hrs. Potassium bromate developed 404 and 479 ppM of oxidizing fragments on 1 and 3 hr exposure respectively. Ultrasonic radiation produced two simultaneous opposing effects in the γ irradiated crystals: chemical damage (sonolysis) and recombination of the damage fragments (ultrasonic annealing). Sonolytic damage annealed on heating. (D.H.M.)

45730 ELECTRON SPIN RESONANCE STUDIES OF FUNDAMENTAL PROCESSES IN RADIATION AND PHOTOCHEMISTRY. III. AQUEOUS SYSTEMS CONTAINING NITRATE AND NITRITE IONS. Ayscough, P. B.; Collins, R. G. (Univ. of Leeds, Eng.). J. Phys. Chem., 70: 3128-32(Oct. 1966).

The ESR spectra of γ-irradiated alkaline, neutral, and acid aqueous glasses containing nitrate or nitrite ions was studied between 77 and 150°K. The spectra were compared with those obtained by photoionization of $Fe(CN)_6^{4-}$ or Fe^{2+} in similar matrices. Trapped paramagnetic species include NO_3^{2-}, NO_3, NO_2, and probably NO_2^{2-}. While the main source of NO_3 and NO_2 is oxidation of NO_3^- or NO_2^-, respectively, by H_2O^+ or OH, it was shown that NO_2 is also formed by the uv-irradiation of NO_3^{2-}, which is the primary

product of the reaction of photochemically generated electrons with NO_3^-. (auth)

45731 IRRADIATION OF n-HEPTADECANE. Salovey, R.; Falconer, W. E. (Bell Telephone Labs., Inc., Murray Hill, N. J.). J. Phys. Chem., 70: 3203-8(Oct. 1966).

Radiolyses of n-heptadecane in the pure state and in the presence of iodine were examined and compared with those of n-hexadecane. Lower cross-linking yields and an unsymmetrical distribution of low molecular weight products resulted from irradiated solid n-heptadecane as compared to solid n-hexadecane. These differences are associated with poorer molecular coupling in the orthorhombic structure of odd n-alkanes than in the triclinic habit of even homologs. The end-linking yield in solid n-heptadecane was larger than in solid n-hexadecane. The combination of heptadecyl radicals yields at least 35 and 80% of the tetratriacontane isomers on irradiation of pure n-heptadecane in solid and liquid states, respectively. (auth)

45732 PULSE RADIOLYSIS OF ANHYDROUS AMINES. Dalton, Larry R. (Michigan State Univ., East Lansing); Dye, James L.; Fielden, E. M.; Hart, Edwin J. J. Phys. Chem., 70: 3358-60(Oct. 1966).

Absorption spectra of products from pulse radiolysis of anhydrous ethylenediamine (distilled from Na and from K), 1,3-propanediamine, n-propylamine, and ethylamine were studied in the 7,000 to 11,200 Å region. For each of the amines tested, the absorbance continued to increase to the cutoff wavelength. Results showed no disagreement between spectral assignments made on the basis of radiolysis and from the spectra of metal solutions in the same solvent. (P.C.S.)

45733 INTRAMOLECULAR ENERGY TRANSFER IN γ-IRRADIATED ALKYLBENZENES. Zeman, A.; Heusinger, H. (Technische Hochschule, Munich). J. Phys. Chem., 70: 3374-6(Oct. 1966).

Hydrogen formation in n-alkylbenzenes and several equimolar mix mixtures of alkane and benzene following gamma irradiation was investigated. Addition of iodine up to 0.5% had no effect on $G(H_2)$. It was found that the extent of alkyl group protection by the phenyl group is affected by the length of the alkyl side chain. The protection decreased with increasing distance of the primarily affected portion of the $-CH_2-$ chain from the phenyl group. (M.C.G.)

45734 MUTUAL INFLUENCE BETWEEN THE EFFECTS OF RADIATION AND THE CRYSTALLIZATION PROPERTIES OF POLYETHYLENE. Chou, Hsiao; Chang, Chih-ping. Kao Fen Tzu Tung Hsun, 7: 386-95 (Nov. 1965). (In Chinese).

Samples of polyethylene irradiated with 1, 20, 50, 100, and 200 megarad γ rays were crystallized from dilute xylene solutions. The morphology of a series of crystals underwent changes regularly as the dose increased. Below the gel point, single crystals could be obtained. Beyond this point, dendritic crystals (becoming more and more irregular with increasing dose) were obtained. But when the crystallizing temperature was lowered or the cooling rate was decreased, regular dendritic crystals or even single crystals could again be obtained. Therefore this change of morphology with increasing dose was not due to changes of structure of the molecules, but to increasing degrees of supersaturation during crystallization. The higher the gel fraction was, the higher the degree of supersaturation. Three kinds of typical crystalline morphology (linear, branched, and three-dimensional network molecules) were observed from irradiated polyethylene. This indicated that within a suitable range of dose, three kinds of molecules do exist in irradiated polyethylene at the same time. The crystallization process of the polymer from dilute solution was also a process of spontaneous separation of unlike molecules and a process of congregation of the like molecules. The morphology of irradiated single crystals was studied with an electron microscope. Some of them remained unchanged, but there were multiple wrinkles on others. Moreover, even in the same single crystal, many wrinkles were found in some sectors, but none in others. The unequal distribution of the wrinkles indicated that a perfect crystal lattice has higher resistance to γ radiation. It also indicated that every sector in a hollow pyramid crystal is a structural unit of more perfect crystalline lattice. (JPRS)

45735 RADIATION OXIDATION OF THIOPHENOL AND SULFUR OILS. Nanobashvili, E. M.; Simonidze, M. Sh. Khim. Seraorgan. Soedin., Soderzhashch. v Neft. i Nefteprod., Akad. Nauk SSSR, Bashkirsk. Filial, 7: 61-4(1964). (In Russian).

It was established that under the effects of x and γ radiation on the thiophenol–benzene system the thiophenol is oxidized to diphenyl disulfide. In the oxidation products formed during irradiation of the thiophenol–water system, diphenyl disulfide and sulfo-acids appear. Under (n,γ) irradiation sulfur oils are desulfurized. The desulfurization easily goes to the much lower fractions. (tr-auth)

45736 RADIATION INDUCED POLYMERIZATION OF β-CHLOROETHYL VINYLPHOSPHONATE. Fujii, Shigetada; Yamakita, Hiromi (Government Industrial Research Inst., Nagoya, Japan). Kobunshi Kagaku, 23: 369-73(May 1966). (In Japanese).

The gamma-induced bulk polymerization of β-chloroethyl vinylphosphonate was studied within the temperature range from −78 to 40°C. The polymerization both in the liquid and the solid phases proceeded by a free radical mechanism, and the activation energy in the liquid phase was similar to that in the solid phase with different frequency coefficients. These were 2.4 and 2.2 kcal/mol, respectively. The G-value of free radical formation was large. The relationships between the rate of polymerization (R_p) or the molecular weight of the polymer ($\overline{M}_n$) and the dose rate (I) were found to be $R_p \propto I^{0.8}$ and $\overline{M}_n \propto I^{-0.22}$, though $\overline{M}_n$ was extremely small. These results are discussed in connection with a degradative chain transfer mechanism. (NSA of Japan)

45737 BEHAVIOR OF HIGH POLYMERS WITH RESPECT TO HIGH ENERGY RADIATION. Heinze, D. Kolloid-Z., 210: 45-54(1966). (In German).

Primary processes in the absorption of radiation by polymers, and the secondary processes, are reviewed. The dependence of structural changes on radiation are discussed. The increase of insoluble portion with dose, temperature dependence of the shear modulus for various irradiation doses, the tearing extension of polyethylene stretched in two dimensions as a function of temperature and dose, and the variation in limiting viscosity of polyisobutylene and poly(methyl methacrylate) illustrate studies of changes in crosslinking. Other studies include gas evolution, double bond variation, reaction balance, crystallinity (which is examined by various density variation experiments) and oxidation experiments. Various correlations of carbonyl group intensities with dose are illustrated. Finally, stabilization and sensitization by the use of additives is discussed. (BBB)

45738 PRIMARY ORGANIC RADICAL FORMED IN THE RADIOLYSIS OF ALIPHATIC ALCOHOLS. Basson, R. A. (Atomic Energy Board, Pretoria). Nature, 211: 629-31(Aug. 6, 1966).

An effort was made to determine the nature of the primary organic radical-precursor of vic-glycol and possibly aldehyde. Only those reactions involving the decomposition of electronically excited molecules (whether formed directly or as the result of the neutralization reaction) were studied. Results indicated the primary production of hydroxyalkyl and alkoxyl radicals. (J.G.B.)

45739 INVESTIGATION OF THERMOLUMINESCENCE OF X-IRRADIATED ALKALI-HALIDE PHOSPHORS. Shamovskii, L. M.; Maksimova, N. D. Opt. Spektrosk., 18: 637-43(1965). (In Russian).

The thermoluminescence and optical flashing were investigated under pulsed illumination in the F-band. It was found that the optical flash increases without time lag, and decreases in two stages, with the slowly damped component

(secondary phosphorescence) lasting as much as 5 minutes. In KCl(Tl) this phosphorescence decreases with decreasing primary phosphorescence at room temperature. Subsequent heating causes it to rise and go through a maximum near +85°C, where a new thermoluminescence peak is observed, credited to V_2 centers. The phenomena observed are explained on the basis of the hole scheme of recombination luminescence, wherein the radiation of the light sum stored in alkali halide phosphors following x-irradiation is the result of recombination of holes with electrons localized in the activator luminescence centers. The phosphorescence observed immediately after excitation corresponds to thermal release of the holes from shallow levels and their recombination with atomic luminescence centers produced during the course of excitation. The thermoluminescence peaks correspond to release of electron-hole pairs from the capture levels and their recombination on the activator luminescence centers. (ATD)

45740 RADIOLUMINESCENCE IN NONORGANIC GLASSES. Orlov, N. F. Optiko-Mekh. Prom., No. 7, 6-11(1965). (In Russian).

General questions concerning luminescence in inorganic glasses excited by radiation are discussed. Radioluminescence of glass in high energy fields is considered in the following terms: luminescence of active centers and particular types of structural formations initially present in the glass; luminescence of impurity centers and certain types of trap centers, generated by the interaction of radiation with the material; luminescence due to radicals created in the process of irradiation; and Cherenkov effect. The first type of luminescence was observed in lead and cerium glasses. Since only trivalent cerium is capable of luminescence, the brightness of luminescence in optic glasses, normally containing tetravalent cerium, is low. Due to the high concentration of lead in flint glasses the extinction is very pronounced, reducing the specific intensity of luminescence. Other activators, e.g., titanium and antimony, present in glass as impurities, do not exhibit measurable amounts of luminescence. Absorption zones present in quartz glass are an example of structural formations capable of luminescence. The second type of luminescence is due to impurity elements not initially contained in the glass, but generated due to the interaction of nuclear particles with the material. The magnitude of this effect is determined by the properties of radiation and the initial concentration of appropriate elements. This effect is utilized in radiation dosimetry. The third type of luminescence results from radicals created due to the ionizing effects of radiation and the breakup of the molecular bonds. The fourth type of luminescence due to the Cherenkov effect is more pronounced in heavy flint glass than in crown glass. This effect is not temperature dependent. The contribution of the second type of luminescence is negligible, compared to the other three types. The effects of temperature, phosphorescence, effects of glass darkening (due to irradiation), and glass structure on radioluminescence are also discussed. The spectral output curves for luminescence of various types of glass are given. (ATD)

45741 USE OF ^{85}Kr RADIATION SOURCE FOR CHEMICAL REACTION IN LIQUID PHASE. Kasamatsu, Tomomichi; Otsuka, Norikatsu (Japan Atomic Energy Research Inst., Tokyo). Oyo Butsuri, 35: 423-9(June 1966). (In Japanese).

An apparatus for irradiation-induced chemical reactions of materials in liquid phase with ^{85}Kr as the source is described. Circulation of bubbling ^{85}Kr gas through the reactant facilitates the reaction. The dose rate is controlled by changing the fractional void and concentration of ^{85}Kr gas. When 1000 ml of water was used as the reactant with 40% fractional void and 5% concentration of the gas, use of 200 C of ^{85}Kr gave a dose rate of 2.8×10^4 rad/hr at 60°C and 0.9 atm pressure. (auth)

45742 RADIATION DESTRUCTION OF SOME ION-EXCHANGE RESINS. Lou, Yun-sheng, Kuzin, I. A.; Semushin, A. M.; Rtishchev, N. I. Plast. Massy, No. 1, 41-4(1965). (In Russian).

A study was made of the resistance to radiation of EDE-10P, AN-2F, AV-17, AN-9, and AMP anionites. The structure of resins was shown to exert greater influence on their resistance to irradiation than the nature of the ions being exchanged. Radiation resistance of anionites is determined mainly by the structure of polymer carcass, structure of anion-exchange groups, as well as by the number and nature of intermolecular bonds. (JPRS)

45743 DIHYDROXYPHENOLS-STABILIZERS FOR IRRADIATED POLYPROPYLENE. Nechitaylo, N. A.; Pospishil, Ya.; Sanin, P. I.; Polak, L. S. Plast. Massy, No. 1, 37-41(1966). (In Russian).

The effects of hydroquinone, 2-methylhydroquinone, 2-tert-butylhydroquinone, 2-tert-octylhydroquinone, 2,5-di-tert-butylhydroquinone, pyrocatechol, 4-methylpyrocatechol, 4-tert-butylpyrocatechol, 4-tert-octylpyrocatechol, and 3,5-di-tert-butylpyrocatechol on the stability of irradiated polypropylene was studied. The initial polypropylene had a molecular weight of 390,000 and was irradiated with ^{60}Co γ radiation of 1.5 to 1.0 M R intensity. Thermodifferential analysis curves, IR spectra, and viscosity for irradiated polypropylene specimens in the presence and absence of air (and containing varying amounts of different dihydroxyphenols) are presented in tables and graphs. The number of chain ruptures produced by the radiation was calculated. It was found that 4-tert-butylpyrocatechol and 3,5-di-tert-butylpyrocatechol were the most effective stabilizing agents. It was concluded that dihydroxyphenols stabilize irradiated polypropylene by inhibiting its reaction with atmospheric oxygen. (ATD)

45744 EFFECT OF GAMMA RADIATION ON HARDENING OF POLYESTERS. Vinogradov, V. M.; Neverov, A. N.; Bocharnikov, V. K.; Trostyanskaya, E. B. Plast. Massy, No. 8, 38-40(1965). (In Russian).

Increasing the polymerization of polyesters in the presence of initiators by radioactive interaction was studied. To establish the possibility of improving hardening of pressed parts from unsaturated polyesters, cast specimens were produced. They were hardened with benzoyl peroxide (1%) with the addition of dimethylaniline (0.01%) at room temperature and then heated to 150°C. At 150°C the reaction was completed in 6 hours when the physical and mechanical properties of the polymer reached a maximum. The following polymers were studied: polyacrylate MGF-9, polymaleinate PN-1 + styrene, polymaleinate + polyacrylate, polymaleinate + polyacrylate + styrene. The optimum properties of polymers were exhibited when they were irradiated with 9 to 35 Mrad doses, depending on the type of polyester, after which the properties degenerated. Polyesters display different behavior when irradiated with 10 to 15 Mrad doses. At higher doses all polyesters behaved alike. The results of this investigation showed that completion of the hardening of polyesters by initiation of the reaction with γ radiation is very effective. Polyesters are destroyed when doses exceed 50 to 70 Mrad. This shows up as reduction in hardness, water resistance, and dielectric properties. The mechanical strength is not affected as greatly. The use of radioactive hardening of fiberglass based on unsaturated polyesters increased the mechanical strength by 30 to 70% and considerably reduced deformation under load at high temperatures. (ATD)

45745 RADIOCHEMICAL GRAFT POLYMERIZATION OF VARIOUS METHACRYLIC ESTERS ON A POLYETHYLENE BASE. Friese, K. Plaste Kautschuk, 12: 144-8 (1965). (In German).

Graft polymerization of the monomers methyl-, n-propyl, n-butyl, n-hexyl-, n-octyl-, and cetylmethacrylate on high-pressure polyethylene film is reported. The investigation was undertaken to investigate the grafting rate in a homologous series of monomers in which the diffusion rate, as well as "polymerization proneness," are continuously changing. The radiochemical method of graft polymerization was used, including the simultaneous irradiation of the polymer and monomer as well as the preliminary irradiation of the polymer in the presence of oxygen, with ultimate complete grafting of the monomer as a result of tempera-

ture increase. In the investigation samples 12 × 100 mm of 0.5-mm-thick, high-pressure polyethylene film, which was pressed between hard chromium-plated sheet metal at a pressure of 5 kp/cm^2 at a temperature of from 115 to 120°C for 2 min to ensure a smooth, scratch-free surface, were used. Comparison of the grafting rate with the polymerization proneness of the completely grafted monomers gave an insight into the typical features of the reaction. (JPRS)

45746 REACTIONS OF RECOIL TRITIUM ATOMS WITH ETHANE IN THE PRESENCE OF VARIOUS INERT MODERATORS. Urch, D. S.; Welch, M. J. (London Univ.). Radiochim. Acta, 5: 201-7(July 1966).

The reactions of recoil tritium (formed by the ^{3}He(n,p) ^{3}He reaction) with ethane were studied using helium, krypton, and xenon as inert moderators, all in the presence of oxygen scavenger. The Wolfgang-Estrup kinetic theory was applied to the results, and the kinetic theory parameters for ethane obtained from each system. The parameters found are discussed in terms of the accuracy of the theory and the type of tritium-moderator collision. (auth)

45747 REACTION OF FISSION-RECOIL BROMINE WITH METHANE. Silbert, M. D.; Tomlinson, R. H. (McMaster Univ., Hamilton, Ontario). Radiochim. Acta, 5: 217-23(July 1966).

Fission-product bromine was isolated from a uranium oxide target by the hot-atom reaction of the fission recoils with methane to form organic halides. The organically bound bromine was shown to be formed preferentially by primary (independently-formed) bromine with little contribution from secondary bromine. (auth)

45748 HOT-ATOM CHEMISTRY OF POTASSIUM TETRACYANONICKELATE. Shibata, Nagao; Fujinaga, Taitiro; Yoshihara, Kenji; Kanchiku, Yoshihiko (Japan Atomic Energy Research Inst., Tokyo. Kyoto Univ.). Radiochim. Acta, 5: 238-9(July 1966).

The chemical effects of the ^{58}Ni(γ,n)^{57}Ni reaction and of the ^{58}Ni(γ,p)^{57}Co reaction were studied in potassium tetracyanonickelate. Four peaks were found by the separation of chemical species labeled with ^{57}Ni by paper electrophoresis. The peaks correspond to the chemical species Ni^{2+}, $Ni(CN)_2$, $[Ni(CN)_4]^{2-}$, and possibly $[Ni(Cn)_3H_2O]$. The chemical forms of ^{57}Co formed by the ^{58}Ni(γ,p)^{57}Co reaction in the irradiated target were studied by ion exchange. The principal species formed by the recoil reaction was $[Co(CN)_4(H_2O_2]^-$. (D.H.M.)

45749 THERMAL ANNEALING BEHAVIOUR OF THE RADIOIODINE RECOILS FORMED BY HIGH-ENERGY PROTON IRRADIATION OF POTASSIUM IODATE. Dema, I.: Zaitseva, N. G. (Inst. of Atomics Physics, Bucharest. Joint Inst. for Nuclear Research, Dubna, USSR). Radiochim. Acta, 5: 240-1(July 1966).

Irradiation of potassium iodate by high-energy protons was used to investigate the possibility that oxygen-free radioiodine recoil fragments might occur in potassium iodate and that these species participate in the annealing processes. Annealing experiments on irradiated potassium iodate showed classical isothermal annealing curves. The recoil energy had little influence on the shape of the annealing curves. The pattern of the annealing process in proton-irradiated potassium iodate was almost the same as in neutron-irradiated materials; therefore it seems more likely that an oxidative transfer annealing mechanism was operative in both cases. (D.H.M.)

45750 INFLUENCE OF HIGH PRESSURE ON THE FREE RADICAL CONCENTRATION IN IRRADIATED MOLECULAR CRYSTALS. Aneli, Dzh. N.; Petrov, A. A. (Inst. of Heteroorganic Compounds, Academy of Sciences, USSR. Zelinskii Inst. of Organic Chemistry, Moscow). Soviet Phys.-Solid State (Engl. Transl.), 8: 1019-20(Oct. 1966).

Translated from Fiz. Tverd. Tela, 8: 1277-9(Apr. 1966).

Molecular crystals of adipic and glutaric acid and glycine were treated with x rays at room temperature (dose ~7 R) and compressed at pressures up to 50 kbar in a shear-under-pressure machine. EPR spectra, infrared spectra, and x-ray photographs were obtained. The data indicate that compression and deformation of the three acids produce a reduction in the free radical concentration. For adipic and glutaric acids over the whole pressure range investigated, the application of pressure with shear results in the loss of a larger number of radicals than the application of pressure alone. For glycine this difference is observed only below 40 kbar. The infrared spectra do not indicate any chemical modifications. Determination of the shear force as a function of pressure shows that at pressures above 6 kbar none of the compounds suffer polymorphous conversion. (A.G.W.)

45751 EPR SPECTRA OF γ-IRRADIATED POLYCAPROLACTAM. Vonsyatskii, V. A.; Taranukha, O. M.; Kalinchenko, A. M.; Egorov, Yu. P. (Inst. of Chemistry of High Molecular Compounds, Kiev). Teor. Eksp. Khim., 2: 384-91(May-June 1966). (In Russian).

The character of the saturation of radicals held in the polycaprolactam matrix was investigated. The radicals were generated by ^{60}Co γ irradiation of vacuum-formed samples, representing threads of capron of two modifications: extruded and nonextruded. It was shown that the expansion is intermediary between the homogeneous and nonhomogeneous states. The effects of radiation dose in the interval from 1.5 to 200 Mrad on the form of the EPR spectrum was investigated as a result of which it was established that with increasing dose the form of the spectrum (quintet) is maintained, but the intensity of the mean components decreases. The saturation factor is reduced but this effect is shown to an equal degree for samples of both modifications: in the case of extruded threads, it is much stronger than in the case of nonextruded threads. Investigation of saturation in samples of the two modifications, irradiated with homogeneous doses, showed that the saturation factor is less for radicals contained in well-regulated matrices (extruded threads of capron). Questions on the chemical nature of the radicals are discussed. (tr-auth)

45752 GRAFT POLYMERS OF COTTON CELLULOSE AND ACRYLONITRILE INITIATED BY RADIATION. Arthur, Jett C. Jr.; Demint, Robert J. (Southern Regional Research Lab., New Orleans). Textile Res. J., 31: 988-9(Nov. 1961).

Interaction of polyacrylonitrile with cotton cellulose was induced by high-energy radiation. Purified and cyanoethylated cotton yarns were interacted with acrylonitrile monomer by application of the monomer to the cotton and by polymerization of the monomer initiated either by ceric ion redox systems or by γ radiation from ^{60}Co. The resulting products were extracted with N,N-dimethyl formamide to remove the weakly interacted monomer and polymer from the yarns. The solubility of the cellulose products in 0.5M cupriethylene diamine at 25°C and the IR spectral data for the products are given. There was a large decrease in the solubility of cellulose of purified cotton-containing polymer, where polymerization was initiated by radiation. The solubility of cellulose of purified cotton-containing polymer, where polymerization was initiated by ceric ion, was zero, as was the case of cellulose of cyanoethylated cotton-containing polymer, where polymerization was initiated by radiation. The IR spectra showed decreases in the OH band intensities of purified cotton cellulose on interaction with polyacrylonitrile initiated by ceric ion or by radiation, and on cyanoethylation of the cellulose. There was no significant change in the OH band intensities of cyanoethylated cotton on interaction with polyacrylonitrile initiated by radiation. It was concluded that graft polymers of cotton cellulose and acrylonitrile were obtained, as evidenced by unextractable polymer add-on, decreased cellulose solubility, and decreased OH band intensities for cotton, indicating grafting induced at the OH group on the cellulose molecule. With cyanoethylated cotton, the relative constancy of the OH band intensities probably indicated grafting at the cyanoethyl group. (BBB)

45753 CHEMICAL EFFECTS FOLLOWING THERMAL NEUTRON CAPTURE. ANNEALING OF RADIOLYTIC AND RECOIL PRODUCTS IN CRYSTALLINE POTASSIUM BROMATE. Andersen, T.; Madsen, H. E. L.; Olesen, K. (Univ. of Aarhus, Denmark). Trans. Faraday Soc., 62: 2409-22(Sept. 1966).

The thermal annealing reactions of radiation- and recoil-induced decomposition of potassium bromate were studied in crystals irradiated at −78 and 20°C using chemical analysis, uv, and thermoluminescence measurements. The annealing of recoil and radiation products occurred simultaneously. The results showed that the annealing of recoil products is closely associated with the release of charge carriers from the radiation-produced fragments: $(BrO-BrO_3)^-$, O_2^-, $(Br-BrO_3)^-$, O_3^-, and BrO_3^{2-}. The decomposition of BrO^- had no effect on the recoil products. (auth)

45754 L.E.T. EFFECTS IN IONIC SOLIDS. PART 1. CHEMICAL DISSOCIATION YIELDS FROM $^{14}N(n,p)^{14}C$ EVENTS IN AZIDES AND NITRATES. Cunningham, Joseph (IIT Research Inst., Chicago. National Physical Lab., Teddington, Eng.). Trans. Faraday Soc., 62: 2423-33(Sept. 1966).

Greater chemical dissociation is reported in normal azides or nitrates irradiated in reactor thermal columns than for ^{15}N-enriched salts similarly irradiated. The difference is attributed to the large cross section for $^{14}N(n,p)^{14}C$ events with thermal neutrons and is used to derive G values for dissociation by the proton and ^{14}C recoiling from a nuclear transformation. Values thus derived were compared with G values reported for radiations of other linear energy transfer (LET). Evidence for increased probability of intermediates reacting in the track, and for dissociation by charge displacement processes, is discussed for nitrates at high LET. Observed LET effects can be accounted for with these two processes without the need to invoke temperature effects in thermal spikes. (auth)

45755 E.S.R. STUDY OF THE FREE RADICALS IN MALONIC ACIDS AFTER IRRADIATION BY X-RAYS AT 77 DEG K. Tamura, N. (Japan Atomic Energy Research Inst., Takasaki); Collins, M. A.; Whiffen, D. H. Trans. Faraday Soc., 62: 2434-43(Sept. 1966).

The radicals proposed to interpret the electron spin resonance spectra of malonic acid and its ethyl, n-propyl, and n-butyl derivatives irradiated with x rays at 77°K are given. The radicals formed and the radicals which disappear on warming to 195°K and finally to 300°K are indicated. (auth)

45756 GAS GENERATION IN RADIATION-OXIDATIVE DESTRUCTION OF POLY-ε-CAPROAMIDE. Brodskii, A. I.; Fomenko, A. S.; Dar'eva, E. P.; Abramova, T. M.; Galina, A. A.; Furman, E. G. (Pisarzhevskii Inst. of Physical Chemistry, Academy of Sciences, Ukrainian SSR). Ukr. Khim. Zh., 32: 549-54 (1966). (In Russian).

Chromatographic analysis was used to find the yields of hydrogen and carbon monoxide from the radiolysis and radiative oxidation of poly-ε-caproamide. G_{H_2} is about 1 mole/100 ev for both processes, and does not change as the dose rate increases from 0.4 to 5.0×10^{18} ev/g min. G_{CO} is equal to 0.3 mole/100 ev for radiolysis and to 0.6 mole/100 ev for radiative oxidation, and increases to 0.9 mole/100 ev as the dose rate increases from 0.4 to 5.0×10^{18} ev/g min. It was found that the combined action of gamma radiation and increased temperature approximately doubles the values of G_{H_2} and G_{CO} in both the radiolysis and radiative oxidation of poly-ε-caproamide at low dose rates, and that the effect of this combined action on G_{H_2} and G_{CO} diminishes with increasing dose rate. The stabilization of poly-ε-caproamide by the addition of the antioxidant di-β-naphthyl-p-phenylenediamine did not change G_{H_2} during radiolysis and radiative oxidation, but markedly reduced the amount of carbon monoxide formed during radiative oxidation. (ATD)

45757 STUDIES ON X-AGENT. XLVIII. FLUCTUATION OF HARDER COMPONENTS OF X-AGENT CAPABLE OF AFFECTING ALKALINE-AQUEOUS SOLUTIONS OF NEUTRAL RED. Moriyama, Hideo (Shonan Hygiene Inst., Kamakura, Japan). Yokohoma Med. Bull., 17: 67-73(June 1966).

In studies of the X-agent, consisting of radiation components said to be of cosmic origin, it is reported that alkaline solutions of neutral red are very sensitive to the soft X-agent, which is reputedly related to sunlight, and are also affected by harder components of the agent that have no relation to sunlight. The effects of X-agent on alkaline solutions of the dye were examined inside and outside a metal box placed in a dark room where the sunlight-related soft agent was excluded. The effect on the dye was different inside and outside the box, but the difference was observed only in daytime, suggesting that the relatively hard component, which can affect the dye solution, originated from the sun. Simultaneous examination of neutral red solution and a bismuth oxychloride solution showed that both solutions behaved similarly toward X-agent. The changes induced in both solutions generally showed similar daily fluctuations. However, this was not always true. In the period from June to October in 1965 the dye solution was scarcely affected. During this period, however, the bismuth oxychloride solution was altered as usual by the agent, though the differences in the daytime between the effects outside and inside the box were not observed. (BBB)

45758 ON THE INITIAL IONS INDUCING RADIATIVE OXIDATION OF NITROGEN. Dmitriev, M. T. (Moscow Hydrometeorological Inst.). Zh. Fiz. Khim., 40: 1739-44 (Aug. 1966). (In Russian).

Energy yields of molecular and atomic ions were determined as functions of the content of nitrogen–oxygen mixtures. With increasing molar fraction of nitrogen, the yield of ions diminished. Correlations of theoretical and experimental data with the yield of nitric oxide and various ions showed that the processes with N_2^+, N^+, O^+, O_2^+ ion participation are the principal reactions of radiative nitrogen oxidation. The efficiency constant for N_2^+ ion reaction with O_2 molecule was equal to 10^{-5} to 10^{-14} cm^3/sec. Correlations of nitrogen oxide ion and molecular yield as a function of electron energy in $N_2 + O_2$ and $N_2 + CO_2$ mixtures showed that nitrogen ions are the main ions inducing radiative oxidation of nitrogen. (R.V.J.)

45759 ELECTRON PARAMAGNETIC RESONANCE IN LOW TEMPERATURE CENTERS OF IRRADIATED MOLYBDATES WITH SHEELITE STRUCTURE. Samoilovich, M. I.; Novozhilov, A. I.; Potkin, L. I. (All-Union Scientific Research Inst.of Synthesis of Mineral Resources, Alexandov). Zh. Strukt. Khim., 7: 618-20(July-Aug. 1966). (In Russian).

The EPR method was used for investigation of $BaMoO_4$, $CaMoO_4$, and $SrMoO_4$ monocrystals at 9.4 Hz frequency and 77°K. The crystals have sheelite-type structure of a tetragonal synchrony, spatial group C_{4h}^6 with four formula units in the cell. X-irradiation revealed two types of paramagnetic centers with corresponding groups of EPR lines. Each group consisted of four anisotropic lines with identical intensity. The first group was distributed along a magnetic field region corresponding to the free radicals; the second line, which was one order of magnitude smaller, was distributed in the direction of the high fields at several Oe from the first line. Results of analysis of the g factor for the crystals are tabulated. (R.V.J.)

45760 RADICALS FORMED DURING THE RADIOLYSIS OF CERTAIN TETRACHLORIDE COMPOUNDS. Maga, M.; Lere, N.; Rozhen, Zh. (Univ., Paris). Zh. Vses. Khim. Obshchest. im. D. I. Mendeleeva, 11: 223-8 (1966). (In Russian).

Group IV metal tetrachlorides were irradiated by gamma rays in sealed quartz ampoules, 5 mm in diameter. The dosages varied from 1 to 100 M-rads, and the dose strength was about one M-rads/hour in the majority of cases. Several experiments were conducted at lower dose strength (0.07 M-rads/hour). The temperature was varied between 80 and 300°K for the EPR spectra. Radiation was carried

out at 77°K and higher temperatures. The existence of the "cage" effect in the solids does not permit, on the basis of radiation yields in the solid state, any conclusions on the radiosensitivity of the compound. On the other hand in view of the existence of the phenomenon of saturation of the yield of the paramagnetic centers, measurements by the EPR method must be carried out at very slight doses in which the number of centers is not large, which indicates the accuracy of the method. The G-values of the substances obtained are presented in a table. (JPRS)

45761 MECHANISM OF FORMATION OF RADICALS DURING RADIOLYSIS OF AROMATIC COMPOUNDS IN THE SOLID PHASE. Buben, N. Ya.; Chkheudze, I. I. Zh. Vses. Khim. Obshchest. im. D. I. Mendeleeva, 11: 228-33(1966). (In Russian).

Investigation of the low-temperature radiolysis of aromatic substances indicated that the radiation yield of radicals in the solid phase can be used for the quantitative estimation of the radiation stability of the compound. To accomplish this it is only necessary to measure the radical yield at a sufficiently low temperature to exclude the recombination of heavy radicals. In fulfilling this condition, the decomposition of one molecule of the initial substance in relation to the radiolytic mechanism results in the stabilization of either one or two radicals. (JPRS)

45762 NATURE OF (n,γ) AND (I.T.)-ACTIVATED BROMINE REACTIONS IN LIQUID ISOMERS OF HEXANE. Merrigan, Joseph A.; Nicholas, J. Blair; Rack, Edward P. (Univ. of Nebraska, Lincoln). 23p. (CONF-660431-7; COO-1617-2). ORAU. Gmelin, AED-CONF-66-120-1.

From Symposium on Hot Atom Chemistry, Lafayette, Ind.

The ^{82}Br organic yields from ^{82m}Br(I.T.)^{82}Br activations were found to be generally 1.7 to 1.8 times the yields of ^{80m}Br, ^{82m}Br, and ^{82}Br from (n,γ)-induced reactions in all of the liquid isomers of hexane at Br_2 concentrations above 0.05 m.f. Scavenger curves and product distributions were found and evaluated with regard to several existing hypotheses of the mechanisms of liquid-state bromine reactions resulting from nuclear activation. A possible correlation was found between organic yields at given Br_2 concentrations and G-values for total organic radicals produced by x rays in the hexanes. This and other considerations support the Auger electron reaction hypothesis for the reactions and systems studied. (auth)

45763 PROCESS FOR POLYMERIZING UNSATURATED MONOMERS USING HIGH ENERGY IONIZING RADIATION. Harlan, James T. Jr.; Bell, Edward R. (to Shell Oil Co.). U. S. Patent 3,265,604. Aug. 9, 1966. Filed June 6, 1960.

The process comprises radioinduced polymerization of unsaturated ethylenic monomers using high-energy ionizing radiation and addition of from 0.1 to 150% by wt of alkali metal halide at −150 to about 0°C. (J.R.D.)

45764 METHOD FOR IMPROVING THE DYEABILITY OF POLYETHYLENE OR POLYPROPYLENE. Japanese Patent 1965-9846. May 20, 1965. Filed Oct. 31, 1959.

To improve the dyeability of polyethylene or polypropylene without affecting their mechanical and thermal properties less than 10% of methylstyrene or dimethylstyrene is grafted to the polyethylene or polypropylene by gamma irradiation. The amino group then is introduced via nitration and amination processes. This method is supplementary to Patent No. 295962 (36-22441). (NSA of Japan)

45765 METHOD FOR PRODUCING POLYMERS OF SYMMETRIC HALOGENOETHYLENES. Yamada, Akira (to Daikin Kogyo Co., Ltd.). Japanese Patent 1965-18431. Aug. 19, 1965. Filed Feb. 25, 1963.

In the method proposed, polymers of symmetric halogenoethylenes of the general formula CXY = CXY (where X and Y are different elements, H and halogens) are obtained by irradiating the monomers with high-energy ionizing radiation in the presence of polymerization catalysts or oxygen. The polymerization is carried out at atmospheric pressure. (TCO)

Radiochemistry

See also Separation Processes and Procedures

Refer also to abstract 45809.

45766 (LA-DC-8103) PRODUCTION OF HEAVY ELEMENTS IN A RECENT LOS ALAMOS THERMONUCLEAR TEST. Hoffman, Darleane C. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [1966]. Contract W-7405-eng-36. 8p. (CONF-660817-3). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Symposium on Why and How Should We Investigate Nuclides Far Off the Stability Line, Lysekil, Sweden.

A low-yield thermonuclear device, designed to give a high-neutron-flux region for the purpose of producing heavy elements by multiple-neutron capture, was recently tested underground in Nevada. This device, Cyclamen, containing ^{238}U and ^{243}Am target material, was the most successful heavy element producer to date, giving an order of magnitude more ^{257}Fm than any previous Nevada test. The mass abundance data indicated that still heavier nuclides should have been produced in amounts sufficient to permit detection, but no evidence for them has yet been found. Although it was not expected that the even mass chains would have survived, predicted α half lives for ^{259}Fm and ^{259}Md are ≈20 years and ≈80 days, and it might be expected that their spontaneous fission half lives would be in the range of about a month. However, if it is assumed that these nuclides were produced with an abundance of $\frac{1}{30}$th that of the mass 257 chain, present data permit the following half life limits to be set: for ^{259}Fm, $t_{\frac{1}{2}}(SF) \leq 5.5$ hr or ≥ 7.5 years and $t_{\frac{1}{2}}(\alpha) \geq 30$ years, and for ^{259}Md, $t_{\frac{1}{2}}(\alpha) \geq 30$ years. The implications of the failure to find evidence for mass 259 are discussed. (auth)

45767 STEROIDS. PART III. SYNTHESIS OF 16 α-CARBOMETHOXY(CARBOXY-^{14}C) PROGESTERONE. DATA ON THE MECHANISM OF ALKALINE HYDROLYSIS OF 3β, 20β-DIHYDROXY-16α-CYANO-Δ^5-PREGNENE. Halmos, M.; Szabo, J. (Jozsef Attila Univ., Szeged). Acta Univ. Szeged. Acta Phys. Chem., 11: 107-13(1965).

3β-Hydroxy-16α-cyano-^{14}C-Δ^5-pregnene-20-one was prepared from 3β-acetoxy-Δ^5, 16-pregnadiene-20-one with K^{14}CN. The latter steroid was reduced with $NaBH_4$ to 3β,20β-dihydroxy-16α-cyano-^{14}C, Δ^5-pregnene and subjected to alkaline hydrolysis. In this way 3β,20β-dihydroxy-16β-carboxy-^{14}C-Δ^5-pregnene-16,20-lactone was obtained together with 3β,20β-dihydroxy-16α-carboxy-^{14}C-Δ^5-pregnene. Esterification and oxidation yielded 16α-carbomethoxy-(carboxy-^{14}C)-progesterone. The alkaline hydrolysis of 3β,20β-dihydroxy-16α-cyano-^{14}C-Δ^5-pregnene and 3β,20β-dihydroxy-Δ^5-pregnene-16α-carboxamide-(carboxy-^{14}C) was also studied to examine the ratio of the formed C-16 isomeric acids. (BBB)

45768 RADIOACTIVE LABELING OF TROPANE ALKALOIDS. V. SYNTHETIC INCORPORATION OF TRITIUM INTO (-)-COCAINE, (+)-PSEUDOCOCAINE, AND (-)-SCOPOLAMINE. Werner, Gottfried; Mohammad, Nek (Max-Planck-Institut fuer Hirnforschung, Frankfurt am Main). Ann. Chem., 694: 157-61(1966). (In German).

An apparatus for simultaneous methylation of two compounds with CH_2TI is described. This was used to prepare labeled cocaine and labeled pseudococaine from CH_2TI and nor(-)cocaine and nor(+)pseudococaine, respectively. The cocaine was then converted into its hydrochloride, sp act. 36 mC/mmole, 69% from norcocaine; the pseudococaine was converted to the hydroiodide, sp act. 35.2 mC/mmole, 74% from norpseudococaine. The scopolamine synthesis was similar, beginning with more active CH_2TI (106.8 mC/mmole) and nor(−)scopolamine to produce the alkaloid, which was then converted to its hydrobromide in ether (71% based on CH_2TI, 98 mC/mmole, radioactive yield 65%). The procedure was then repeated with nonradioactive scopolamine hydrobromide, using the mother liquors from

the radioactive synthesis, thus producing material with sp. act. 9.15 mC/mmole. All products appeared to be pure by chromatography, electrophoresis, and dilution analysis. Apparatus for evaporation of radioactive solutions and for ether extraction of solutions is described. (BBB)

45769 ISOTHIOCYANIC ACID ESTERS. XVI. PRODUCTION OF ISOTHIOCYANIC ACID ESTERS LABELED IN THE FUNCTIONAL GROUP NCS WITH THE RADIONUCLIDE ^{35}S. Augustin, J.; Drobnica, L.; Kouril, F. (Slovak Polytechnic Inst., Bratislava). Chem. Zvesti, 20: 687-91(1966). (In Czech).

The rate of isotopic exchange between elementary sulfur ^{35}S and isothiocyanates R-NCS was studied to prepare isothiocyanates labeled with ^{35}S in the functional group NCS. At 180°C the exchange between the mono- and polynuclear aromatic and alicyclic isothiocyanates was sufficiently rapid and sustained negligible thermal disintegration. Data suggested a universal method for R-RNC ^{35}S isothiocyanate production by direct isotopic exchange between isothiocyanates and elementary ^{35}S without a solvent. The pure labeled isothiocyanate is separated after eliminating sulfur and possible decomposition products. (R.V.J.)

45770 ROLE OF DONOR-ACCEPTOR INTERACTION IN THE SEPARATION OF ISOTOPES BY CHEMICAL EXCHANGE. Pechalin, L. I.; Panchenkov, G. M. (Moscow State Univ.). Dokl. Akad. Nauk SSSR, 168: 382-5(May 11, 1966). (In Russian).

When an electron goes from the higher molecular orbit of the donor (D) to the free molecular orbit of the acceptor, the ground state of the 1 : 1 complex is described by a wave function that predicts that $\alpha = m\text{-}n\ I$, where α is the separation factor; m and n are constants, and I is the ionization potential of the donor. In separating boron isotopes by chemical exchange by using molecular compounds formed by the electron acceptor BF_3 with ethers, sulfides, and amines, the following relation was obtained at a temperature of about 20°C: $\alpha = 1.060 - 3.01 \times 10^{-3}\ I$. In separating sulfur isotopes by complexing SO_2 with amines, ethylene oxide, or aniline at ~20°C, the relation was found to be: $\alpha = 1.0109 - 9.8 \times 10^{-4}\ I$. In separating hydrogen isotopes by chemical exchange, it is found that $\alpha = 5.416 - 0.444\ P$, where P is the affinity of the donor for a proton. Hence, it was concluded that tabulated values of I and P can be used as guides in separating isotopes by means of molecular compounds. (TTT)

45771 ISOTOPIC EXCHANGE KINETICS AND THE MECHANISM OF PHENYLMERCURICHLORIDE REACTION WITH MERCURIC CHLORIDE LABELED WITH ^{203}Hg. Smolina, T. A.; Chow, Mei-chu; Reutov, O. A. (Moscow State Univ.). Izv. Akad. Nauk SSSR, Ser. Khim., No. 3, 413-17(1966). (In Russian).

Kinetics and mechanism of isotopic exchange reactions of phenylmercurichloride with mercuric chloride (labeled with ^{203}Hg) in anhydrous toluene were studied. The activation energy of the reaction was found to be 6093 kcal-mole. (R.V.J.)

45772 STUDY OF ACID INSOLUBLE IODATES WITH RADIOACTIVE TRACERS. Purkayastha, B. C.; Sen, Shyamoli (Saha Inst. of Nuclear Physics, Calcutta). J. Indian Chem. Soc., 43: 404-10(June 1966).

Homogeneous and heterogeneous distribution laws were studied with ^{210}Bi and UX_1 (tetravalent actinides) as guests and iodates of bismuth, zirconium, cerium(IV), and lead as hosts. Bismuth iodate takes up UX_1 through mixed crystal formation both at tracer and finite concentrations of the guest component. In the case of zirconium iodate as host and UX_1 as guest, zirconium iodate was found to take up UX_1 through mixed crystal formation. Zirconium iodate does not take up ^{210}Bi through mixed crystal formation. Lead iodate takes up neither UX_1 nor ^{210}Bi through mixed crystal formation. In the case of UX_1, the extent of uptake is very low. Of the host components, which take up UX_1 through mixed crystal formation, partition values in the case of bismuth iodate as host are highest. Bismuth can easily be removed as sulfide, leaving carrier-free UX_1 in solution. A method for the quantitative recovery of carrier-free UX_1 or tetravalent actinides was developed using bismuth iodate as carrier, which does not take up tetravalent actinide analogues such as $^{152,154}Eu$ and many of the fission products such as $^{89,90}Sr$ and ^{90}Y. As regards the preparation of a carrier-free tetravalent actinide source, free from tervalent actinides, bismuth iodate is recommended as a dependable carrier for routine laboratory work. Mechanism of the uptake and the compositions of these iodates are discussed briefly. (auth)

45773 THE PREPARATION OF $H_2{}^{18}{}^{18}O_2$. Ball, R. E.; Edwards, J. O.; Jones, P. (Brown Univ., Providence). J. Inorg. Nucl. Chem., 28: 2458-60(Oct. 1966).

A discussion of three methods of preparing $H^{18}O^{18}OH$ is given. The methods compared are: a conventional chemical route involving the intermediate preparation of $Na_2{}^{18,18}O_2$ from sodium and $^{18,18}O_2$; direct conversion of $H_2{}^{18}O$ vapor in an electric discharge; and high-frequency electrode-less discharge of water vapor. The factors considered are convenience, efficiency, and cost. Experiments using the second method are described. (D.H.M.)

45774 THE REMOVAL AND CONTROL OF ^{131}I CONTAMINATION IN SODIUM O-IODO^{131} HIPPURATE. Hosick, Thomas A.; Watts, F. Clay; Meschan, I. (Wake Forest Coll., Winston-Salem, N. C.). J. Nucl. Med., 7: 643-6(Aug. 1966).

A method was found for removing contaminating ^{131}I-labeled sodium iodide from radio-Hippuran (and other water-soluble salts of radioiodinated organic compounds) and for keeping such contamination at acceptable levels during the shelf-life of the compound. The solution of radio-Hippuran is allowed to remain in contact with microporous carbon boiling chips impregnated with freshly precipitated silver chloride. The iodide-131 ions are replaced by chloride ions. Minimal contamination of the solution with silver chloride is obtained. (auth)

45775 OPTIMUM PRESSURE IN ISOTOPE SEPARATION. Zel'venskii, Ya. D.; Nikolaev, D. A.; Shalygin, V. A.; Tatarinskii, V. S. (Mendeleev Inst. of Chemical Technology, Moscow). Khim. Prom., 41: 362-6(1965). (In Russian).

Separation of water containing $H_2{}^{18}O$ and a small amount of tritium was carried out in an adiabatic column packed with stainless steel spirals and operating under total reflux conditions. Reflux rate was 175 to 960 kg/hr/m^2 for 40 to 100 hrs with pressures varying from 50 to 760 mm Hg at the head of the column. The degree of separation for both the ^{18}O and the tritium isotope increased with decreasing flux rate while increasing pressure had the opposite effect. Both isotopes showed a maximum at P = 100 to 140 mm Hg in contrast to 120 mm Hg as the optimum separation pressure for water. (P.C.S.)

45776 TRITIATION OF GASEOUS HYDROCARBONS IN ELECTRIC DISCHARGE FIELDS. Selz, Hanne; Lorenzen, Knut (Technische Hochschule, Munich). Radiochim. Acta, 5: 207-12(July 1966). (In German).

The tritium content of methane and ethane during tritiation in an electric discharge at a total pressure of 1 mm Hg was determined as a function of reaction time. The curve of yield vs. time reached a maximum, after which the concentration of the tritiated hydrocarbon decreased due to a decomposition reaction. The optimal yield of tritiated hydrocarbon is considered. (auth)

45777 SZILARD-CHALMERS REACTION OF THE TRIOXALATOCHROMIUM ION ADSORBED ON AN ANION-EXCHANGE RESIN UNDER CONTINUOUS ELUTION CONDITIONS. II. EFFECTS OF FLOW RATE AND OF MESH SIZE OF RESIN (WITH APPENDIX: ON THE CHEMICAL FORM OF THE RECOILING CHROMIUM SPECIES). Matsuura, Tatsuo; Sasaki, Takashi (Rikkyo Univ., Yokosuka, Japan). Radiochim. Acta, 5: 212-17(July 1966).

In the dynamic separation of recoiling species during reactor irradiation of trioxalatochromium ions on an ion-exchange resin, the effects of flow rate and of mesh size of resin on the separable yield were studied for the condition of p_H 2 to 4 by nitric, acetic, and oxalic acids as

eluent. It was found that about 4 ml per minutes per 10 ml resin was the optimum flow rate to obtain the maximum yield. The separable yield increased with the decreasing bead radius of resin and this dependence was analyzed theoretically by assuming a simple model, from which the initial yield and the recombination rate constant vs. mobility ratio of the separable species in the bead were estimated for each irradiation condition. (auth)

45778 ELECTROCHEMICAL METHOD FOR PURIFICATION OF NaI WITH CARRIER FREE ^{131}I AND FOR INCREASING ITS SPECIFIC RADIOACTIVITY. Kazarinov, V. E. Radiokhimiya, 7: 738-9(1965). (In Russian).

Currently available $Na^{131}I$ preparations have a specific activity of only 0.5 to 5 mC/ml and the heavy-metal content of the solutions may reach 0.05 mg/ml. As a result of this, most of the radioactive atoms are present in the solution not as I^- ions but as a complex with heavy metals. In order to remove the heavy metals from the solution, an electrochemical purification scheme was developed; it involved adsorption of the I^- ions on an electrochemically activated platinum electrode. The ions were desorbed by subjecting the electrode to cathodic polarization at pH = 10 in KOH or NaOH solutions at 10 m amp/cm^2 for two minutes in a cell provided with separate anode and cathode compartments. The heavy metals are only partially adsorbed on the platinum and are not desorbed at all. It was found possible to prepare heavy-metal-free $Na^{131}I$ solutions with specific activities up to 50 mC/ml starting from the 3 mC/ml solution. The purification may be completed within one hour both on the laboratory and industrial scale. (TTT)

45779 ELECTROCHEMICAL METHOD FOR DEVELOPING CARRIER FREE RADIOACTIVE IODATE SOLUTIONS. Balashova, N. A.; Kazarinov, V. E. Radiokhimiya, 7: 739-41(1965). (In Russian).

Using a labeling technique based on ^{131}I, it was demonstrated earlier that the iodide adsorbed on platinum and desorbed in acid solution at potentials more positive than +1.2 is present in the solution in the form of ions. This question was further examined by studying the behavior of iodide ions adsorbed on platinum from acid solutions of sodium iodide, containing carrier-free iodine ions at concentrations $C_{NaI} < 10^{-7}$ M. After adsorption, the iodine ions had a covalent bond with the surface and were in a state between the ionic and atomic states. It was found that under such conditions, the desorption of iodine at potentials more positive than +1.2, yields IO_3^- ions. It is proposed to use this method for the electrochemical preparation of solutions containing carrier-free IO_3^- ions, using a polished platinum electrode as the adsorber and making it the anode in a cell possessing separate anode and cathode compartments. The current is chosen to ensure the potential required for the formation of the IO_3^- ions. (TTT)

45780 CHEMICAL CHANGES TAKING PLACE IN β DECAY OF RaE COMBINED WITH PARA-PHENETHYL DERIVATIVES AS A METHOD OF SYNTHESIS OF SIMILAR DERIVATIVES OF POLONIUM. Nefedov, V. D.; Gracheva, L. M.; Grachev, S. A.; Petrov, L. N. Radiokhimiya, 7: 741-4(1965). (In Russian).

Continuing previous studies on the chemical changes due to the β decay of RaE contained in aryl derivatives, the para-phenethyl derivative of trivalent bismuth, $(p\text{-}C_2H_5OC_6H_4)_3Bi$(RaE) prepared by means of the Grignard reaction, was examined. Purity of the preparation, which had a specific activity of about 2 μC/mg, was ascertained by melting point determinations and paper chromatography, using the same method for the separation, identification, and determination of the decay products, collected for one month. Corresponding tellurorganic compounds, labeled with ^{127}Te, served as the carrier. Two forms of polonium were discovered in the decay products: $(p\text{-}C_2H_5OC_6H_4)_3PoX$ and $(p\text{-}C_2H_5OC_6H_4)_2Po$. The first one is the result of the stabilization of the primary molecular ion $[(p\text{-}C_2H_5OC_6H_4)_3Po]$ while the second is the product of the fragmentation of this ion. The increase of the yield of this stabilization product may be due to the effect of the substitution in the benzyl radical on the strength of the Po–C bond in the corresponding molecular ions. (TTT)

45781 A QUICK METHOD TO DETERMINE THE CONVERSION NUMBER OF INORGANIC IODINE INTO ^{131}I-PROTEIC IODINE. Szantai, I. Stud. Cercet. Biochim., 8: 85-8(1965). (In Rumanian).

An ion-exchange resin technique is reported for determining the conversion number of inorganic iodine into ^{131}I-labeled proteic iodine. Experiments have been performed on a Cl^- Merck II weak-base anionite resin type. The technique was checked by comparing the results obtained to those recorded by the precipitation method as well as by simultaneous tests on the same resin. Near values were recorded with both methods, and the interval required for the determination of the conversion number was lowered by over 50%. In addition, the capacity of fixation in weak-base anionates was twice that of strong- and very strong-base anionates, which could allow for some technical improvements of this procedure. (Rumanian Sci. Abstr.)

45782 TAUTOMERISM OF 2-PICOLYL KETONES. I. NMR INVESTIGATION OF 2-PICOLYL PHENYL KETONE AND 2-PICOLYL ISOPROPYL KETONE AS WELL AS ^{15}N-LABELED HOMOLOGS. Klose, G.; Uhlemann, E. (Karl-Marx-Univ., Leipzig). Tetrahedron, 22: 1373-7(Apr. 1966). (In German).

Spectroscopic studies in the uv and ir range and nuclear magnetic resonance (NMR) studies have shown that 2-picolyl ketones, as other β-ketones, undergo tautomerization, the keto and enol forms being present simultaneously in solution. The tautomeric equilibria existing in solutions of 2-picolyl ketones were studied by NMR methods. Beside the keto and enol forms stable at low temperatures, a new tautomeric species is formed at higher temperatures. In accordance with HMO calculations a pyridinium structure has been assigned to this tautomer. The energies of transformation have been determined. Synthesis of ^{15}N-labeled 2-picolylphenyl ketone, 2-(5-ethylpicolyl)-phenyl ketone, and 2-(5-ethylpicolyl)-isopropyl ketone is described. The synthesis of ^{15}N-labeled 2-picolyl ketones followed the method of Goldberg et al. (J. Am. Chem. Soc., 77: 3647 (1955)). As starting materials, ^{15}N-labeled 5-ethyl-2-picoline was prepared from ^{15}N-ammonia and paraldehyde treated in an autoclave. (BBB)

45783 SYNTHESIS OF RADIOACTIVELY LABELED COMPOUNDS. XVI. THE PREPARATION OF BIS-(5-AMINOPENTYL)-AMINE-(1,1',5,5'-^{14}C). Knoefel, D.; Unverricht, A.; Orban, U.; Schuette, H. R. (Deutsche Akademie der Wissenschaften zu Berlin, Halle, Ger.). Z. Chem., 6: 184-5(May 1966). (In German).

A mixture of piperidine-(2,6-^{14}C), pulverized NaOH, water, and benzoyl chloride was allowed to stand for 1 to 2 hours; then the mixture was extracted with benzene, washed, dried, and evaporated; and the residue was chromatographed over alumina to give N-benzoylpiperidine-(2,6-^{14}C) in 98% yield. This material was heated with PCl_5 until fusion of the PCl_5 occurred and then at 135°C for several hours. After cooling, ice was added, the pH adjusted to 4.5, and benzonitrile steam distilled off. The $CaCl_2$ complex of the residue was prepared and decomposed with water to give chloroamylbenzamide-(^{14}C). This compound was dissolved in NH_3-saturated ethanol and heated in a bomb several hours on the steam bath to give bis-(5-benzoylaminopentyl)-amine-(^{14}C) and other products after evaporation. After hydrolysis with concentrated HCl at 140°C and extraction of benzoic acid with ether, the mixture of hydrochlorides was chromatographed over Dowex 50 (acid form) with 2.5N HCl; cadaverine separated from the desired product (hydrochloride). Further chromatography over cellulose with 4:1:1 butanol-acetic acid-water gave, chromatographically and autoradiographically, a singular product. (BBB)

45784 NEUTRON IRRADIATION PROCESS FOR PRODUCING RADIOISOTOPES WHEREIN TARGET ISOTOPE IS SHIELDED FROM THERMAL NEUTRONS. Ransohoff, Jackson A.; Wood, Phillip M. (to Neutron Prod-

ucts, Inc.). U. S. Patent 3,269,915. Aug. 30, 1966. Filed July 5, 1963.

A process is described for producing in good yield a product radioisotope, particularly ^{238}Pu, ^{227}Ac, ^{198}Au, and ^{182}Ta, by neutron absorption capture in a target radioisotope with a thermal neutron cross section lower than that of the product isotope. The target isotope is incorporated in an irradiation device so that the surface density of the target isotope is at least 0.1 g/cm^2. The target isotope is shielded from exposure to the thermal neutrons by incorporating, peripheral to the target isotope, a nuclide material having a high neutron interaction resonance peaking at a neutron energy below 0.3ev. The target is irradiated in the environment in which the neutron flux is between 0.3 and 100 ev. The target material may even be intimately mixed with the target material. The target and product are separated and recovered by chemical processing. (B.L.M.)

45785 MEGACURIE ISOTOPE PRODUCTION FACILITY. DeRienzo, P. P. (Burns and Roe, Inc., New York); Weissmann, T. 20p. (CONF-651110–27; CONF-651132–7). ORAU. Gmelin, AED-CONF-65-327-6.

From American Society of Mechanical Engineers, Annual Winter Meeting, Chicago.

The facility design for processing the spent fuel of the Pu production reactors is considered. The plant is to be situated in the 200 area of the Hanford Works in Richland, Washington. The facility has capabilities for producing encapsulated sources of the following isotopes: ^{90}Sr, 29 MC/yr; ^{137}Cs, 29 MC/yr; ^{144}Ce, 200 MC/yr; and ^{147}Pm, 53 MC/yr. A separate process line is provided for each isotope. These lines are contained in four series of hot cells with only minor differences in the types of equipment contained in each series. Main differences in the production lines are found in the head end equipment in which some isotope feeds undergo purification and treatment prior to conversion to solids. The feed material for the isotope sources is received from the Hanford Waste Management process in four separate streams. After the isotopes are obtained in the form of precipitates, they are dried and pulverized, and the powder is compacted. The compacts are seal welded into containers that are leak checked and decontaminated. Finally, the encapsulated sources are combined into fuel core assemblies to suit the needs of the individual user. The paper briefly describes the strontium-90 process with its associated equipment and the principal design features of the FPCE facility for megacurie quantities, particularly as they relate to the implementation of the health and safety criteria. (auth)

Separation Processes and Procedures

See also Analytical Procedures
ISOTOPE TECHNOLOGY — Separation and Production

Refer also to abstracts 45999 and 46134.

45786 (COO-119-234, pp 277-96) SOLVENT EXTRACTION OF Np(VI) USING BIS-(DI-N-HEXYLPHOSPHINYL) ALKANES. El-Ezaby, M. S.; Stover, B. J. (Utah Univ., Salt Lake City. Radiobiology Div.).

Bis-(di-n-hexylphosphinyl) alkanes, dissolved in o-dichlorobenzene were used to extract the hexavalent oxidation state of neptunium (NpO_2^{++}) from aqueous perchloric acid solutions. It was found that bis-(di-n-hexylphosphinyl) methane (HDPM) extracted neptunium (VI) more effectively than the compounds with n = 2, 3, or 4 over a tenfold range of $HClO_4$ concentrations. Thus HDPM was chosen for more extensive study. It was found that as the ratio of HDPM concentration to that of neptunium increased, the distribution ratio increased. From the partition data it was calculated that the extracted species was a one to one Np-HDPM complex. The extraction of neptunium VI (NpO_2^{++}) with these organophosphorous compounds was compared with that of uranium VI (UO_2^{++}). (auth)

45787 (ORNL–3945) CHEMICAL TECHNOLOGY DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING MAY 31, 1966. (Oak Ridge National Lab., Tenn.). Sept. 1966. Contract W-7405-eng-26. 287p. Dep. mn. CFSTI $6.00 cy, $1.50 mn.

Twenty-three sections are included; separate abstracts were prepared for 21. The remaining sections include information on the water research program and the chemistry of carbides and nitrides. (P.C.H.)

For abstracts of individual sections see: 45570, 45571, 45575, 45628–45631, 45714, 45788–45799, and 47083.

45788 (ORNL–3945, pp 27-47) POWER-REACTOR FUEL PROCESSING. (Oak Ridge National Lab., Tenn.).

Head-end methods designed to produce suitable aqueous feeds for solvent extraction including both mechanical and chemical treatments are described. The major processes studied included a grind-leach process for U-Th-graphite HTGR (high-temperature gas-cooled reactor) fuel, the shear-leach process for metal-clad oxide fuels, and caustic decladding and shear-leach for SAP-clad UC fuel for an HWOCR (heavy-water-moderated, organic-cooled reactor). Work on fuel recovery processes for LMFBR (liquid-metal fast-breeder reactor) fuel was begun, and efforts on close-coupled processes were continued. Development of a process to adsorb protactinium on unfired Vycor glass was concluded in hot-cell experiments with highly irradiated 27-day-cooled ThO_2–UO_2. Close-coupled processing development included the completion of a survey to determine whether methods other than solvent extraction were suitable for low-cost, low-decontamination fuel processing. (P.C.H.)

45789 (ORNL–3945, pp 48-71) FLUORIDE-VOLATILITY PROCESSING. (Oak Ridge National Lab., Tenn.).

Laboratory- and small-engineering scale studies were made in support of the fluidized-bed volatility process, particularly the HF–O_2 method for stainless-steel and Zircaloy-clad UO_2 fuels. Corrosion and continuous in-line monitoring of gas streams in the fluidized-bed fluoride-volatility process were also studied. Developments are reported for studies on sorption of PuF_6 by metal fluorides, separation of UF_6 from bromine fluorides, behavior of Cr in volatility processing, and vapor-liquid equilibria of UF_6–NbF_5 system. (P.C.H.)

45790 (ORNL–3945, pp 72-8) MOLTEN-SALT REACTOR PROCESSING. (Oak Ridge National Lab., Tenn.).

Developments in the continuous fluorination and vacuum distillation of the molten salt and studies of alternative methods of processing the fuel salt of a molten-salt breeder reactor are reported. Fluorination tests in which molten salt (NaF–LiF–ZrF_4) containing 0.5 wt % UF_6 was contacted countercurrently with fluorine at 600°C demonstrated removal of uranium from the salt with 96 to 99.4% efficiency in a 1-hr period of continuous operation. A flowsheet for the proposed MSBR uses a semicontinuous distillation process to remove rare earth fission products from the reactor fuel. Liquid-metal extraction was studied as a possible substitute for vacuum distillation. (P.C.H.)

45791 (ORNL–3945, pp 107-28) TRANSURANIUM-ELEMENT PROCESSING. (Oak Ridge National Lab., Tenn.).

The development of chemical processes and design and fabrication of process equipment for transuranium element processing are reported. The status of the Transuranium Processing Plant is described. Studies made on methods for dissolving irradiated and unirradiated refractory PuO_2 indicate that irradiated PuO_2 dissolves more readily than the unirradiated PuO_2. Methods were also developed for the preparation of ^{241}Am, ^{244}Cm, and mixed ^{243}Am–^{244}Cm sols. Equipment was designed and built to separate and recover the actinide elements from irradiated HFIR target rods. (P.C.H.)

45792 (ORNL–3945, pp 129-40) CURIUM PROCESSING. (Oak Ridge National Lab., Tenn.).

Details of the Clanex, Dapex, and Tramex recovery processes are discussed, followed by sections devoted to ^{242}Cm and ^{244}Cm recoveries in the Curium Recovery Facility (CRF) and a series of tests conducted at high radiation levels to evaluate a number of alternate flowsheets. A brief description of equipment, modifications, and operating experience in the CRF is also included. (P.C.H.)

45793 (ORNL–3945, pp 141-56) DEVELOPMENT OF THE THORIUM FUEL CYCLE. (Oak Ridge National Lab., Tenn.).

Laboratory studies were made of sol-gel methods for preparing dense UO_2–ThO_2 bodies containing more than 10 wt % UO_2 and for preparing dense thorium dicarbides from thoria–carbon sols. A process was developed for preparing thoria and thoria–urania spheres 50 to about 800 μ in diameter, of high strength and nearly theoretical density. Construction of the Thorium–Uranium Recycle Facility (TURF) and design of process equipment are described, along with a 5-kg/day ^{233}U dissolver-leacher, limited in size to ever-safe criticality dimensions, for use as a metal or oxide dissolver, or as a leacher for chopped, metal-clad fuel elements. (P.C.H.)

45794 (ORNL–3945, pp 157-75) SOL-GEL PROCESSES FOR THE URANIUM FUEL CYCLE. (Oak Ridge National Lab., Tenn.).

Sol-gel processes for preparing urania and plutonia microspheres are described. Studies were also made on the preparation of UN and ZrO_2 microspheres by the sol-gel process. The chemical development of improvements in the laboratory process, investigation of other methods of urania sol preparation more amenable to engineering scaleup, and study of an alternative method of preparing gel microspheres are discussed. (P.C.H.)

45795 (ORNL–3945, pp 176-88) SEPARATIONS CHEMISTRY RESEARCH. (Oak Ridge National Lab., Tenn.).

Studies in separations chemistry are discussed in relation to three interdependent types of research activity: descriptive chemical studies of the reactions of substances to be separated and of separations reagents, of the controlling variables in particular separations, and of new compounds that may be potential reagents; development of selected separations into specific complete processes, both where no workable process yet exists and where existing processes can be improved, carried where warranted to the point that large-scale performance can be predicted; and fundamental chemical studies of the equilibria and reaction mechanisms involved in separation systems, both to increase knowledge and to help define potential applications. (P.C.H.)

45796 (ORNL–3945, pp 195-8) RECOVERY OF FISSION PRODUCTS BY SOLVENT EXTRACTION. (Oak Ridge National Lab., Tenn.).

Several recovery processes developed and tested previously, but only with simulated reactor-fuel-reprocessing waste solutions at tracer level, were demonstrated successfully with Purex STW (sugar-treated waste) solution from Hanford. In a mixer-settler demonstration of the Phenex process for recovering Cs by extraction with 4-sec-butyl-2-(α-methylbenzyl)phenol (BAMBP), Cs recovery was more than 98%, and separation of Cs from other fission products and from bulk metals was efficient. In batch tests, Ce was separated selectively from a mixed fission product rare earth solution by oxidizing the Ce with silver-catalyzed persulfate and extracting with bis(2-ethylhexyl) phosphate (D2EHP). Ruthenium recoveries from Purex STW solution by extraction with a tertiary amine were much more effective than those obtained previously from simulated waste solutions. D2EHP was also used for extracting Nb–^{95}Zr from waste solutions and for separating Pm from mixed fission product rare earths. A new and simplified flowsheet is outlined for recovering rare earths, strontium, and cesium from Purex waste. (P.C.H.)

45797 (ORNL–3945, pp 199-207) BIOCHEMICAL SEPARATIONS. (Oak Ridge National Lab., Tenn.).

Methods for separating transfer ribonucleic acids (tRNA's) are discussed. 300 kg of E. coli W cells were harvested, following continuous fermentation, and processed to yield 630 g of mixed tRNA's. The feasibility of measuring the molecular weight of tRNA by membrane osmometry was demonstrated. Preliminary data on crude, mixed tRNA's gave molecular weights ranging from 33,200 to 36,500 in the temperature range 37 to 17°C. An automatic high-resolution analyzer capable of quantifying uv-absorbing molecular constituents of urine was developed for use as a clinical tool and in human biochemical research. (P.C.H.)

45798 (ORNL–3945, pp 230-2) CHEMICAL ENGINEERING RESEARCH. (Oak Ridge National Lab., Tenn.).

An experimental seven-stage stainless steel stacked-clone contactor has undergone further testing with a variety of chemical systems including hexone–acetic acid (in which a solution residence time of 2 sec per theoretical stage was realized) and mineral oil–dilute HNO_3 (in which the dispersed phase had a very high viscosity). Operation in the organic-continuous mode was demonstrated with Amsco–dilute HNO_3, and further tests involved the high aqueous-phase viscosities of glycerol and dextrose solutions. The effects of solid-particle impurities in the aqueous feed were also noted. A 14-stage stacked-clone contactor (plant prototype) with integral pumps was fabricated and installed; it is now being tested with the system TBP–Amsco–$NaNO_3$–$UO_2(NO_3)_2$–water. (auth)

45799 (ORNL–3945, pp 234-40) REACTOR EVALUATION STUDIES. (Oak Ridge National Lab., Tenn.).

Developments are reported for cost studies of shipping fresh and spent nuclear fuel, processing spent fuel (including final waste disposal), and preparing various virgin and recycle fuel materials (oxides, fluorides, metals, etc.) in connection with the ^{233}U value study, the HWOCR (Heavy-water Moderated, Organic-Cooled Reactor) evaluation, and the new nuclear power evaluation handbook. Also, computer codes were developed for calculating shipping and processing costs and the overall cost of nuclear power, and for calculating the gamma-shielding requirements of fuel-handling facilities. The optimization of the size of fuel processing plants in a growing economy was also studied. (P.C.H.)

45800 (ORO–2576-23) EXTRACTION OF CERTAIN ANIONIC METAL CHELATES BY LONG-CHAIN ALKYL AMMONIUM COMPOUNDS. Sato, Taichi; Good, Mary L. (Louisana State Univ., New Orleans. Dept. of Chemistry). Aug. 1966. Contract AT(40-1-)-2576. 16p. (CONF-660805–5). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Solvent Extraction, Goteborg, Sweden.

The results of studies on the extraction process and the structure of the thorium and uranium chelates of 1,2-dihydroxy-anthraquinone-3-sulfonate (ARS) extracted by Aliquat-336 (tricapryl monomethyl ammonium chloride) are described. From infrared spectral studies it was found that the uranyl complex resembles that of the thorium complex except for the appearance of the uranyl asymmetric stretch at 926 and 909 cm^{-1}. In the chemical analysis of the extracted metal chelates, the absence of chloride and the presence of H_2O in the complex was noted, which indicates that the coordination sites not occupied by ARS are apparently occupied by H_2O and/or OH^-. Structures for the chelates are proposed. (P.C.H.)

45801 (AEC-tr–6638) TECHNOLOGY OF URANIUM. Galkin, N. P.; Sudarikov, B. N.; Veryatin, U. D.; Shishkov, Yu. D.; Maiorov, A. A. Translation of Tekhnologiya Urana, Atomizdat, Moscow, 1964. 432p. (IPST-Cat.–1530). Dep. mn. CFSTI $7.32 cy, $2.00 mn.

Information is included on: history of the development of the uranium industry; uses of uranium; main stages in the production technology of uranium and methods for improving technological processes; chemical and physicochemical properties of uranium and its more important compounds; uranium, ores, minerals, and deposits; mechanical treatment of uranium ores; leaching of uranium ores; processing ore solutions and slurries by ion exchange; processing

leach liquors by solvent extraction; precipitation of uranium-containing solutions: preparation of pure uranium salts from uranium concentrates; production of uranium oxides; production of UF_4; production and processing of UF_6; and manufacture of metallic uranium. (P.C.H.)

45802 RADIOTRACER STUDIES ON THE EXTRACTION OF METAL IONS. X. EXTRACTION OF CALCIUM, IRON, NICKEL, COPPER, AND ZINC WITH SOME AROMATIC SCHIFF BASES. Stronski, I.; Zielinski, A. (Inst. of Nuclear Physics, Krakow). Isotopenpraxis, 2: 291-4(July 1966).

Using the radioactive indicators ^{45}Ca, ^{59}Fe, ^{63}Ni, ^{64}Cu, and ^{65}Zn the yield of extraction (%E) of Ca(II), Fe(III), Ni(II), Cu(II), and Zn(II) with quadridentate Schiff bases, which are products of condensation of salicylaldehyde and its derivatives with ethylenediamine, 1,3-propylenediamine, and o-phenylenediamine was investigated as a function of the pH of the electrolyte. (auth)

45803 RECOVERY OF ^{234}U AT HIGH ISOTOPIC ABUNDANCE BY CHEMICAL SEPARATION METHODS. Figgins, P. E.; Belardinelli, R. J. (Mound Lab., Miamisburg, Ohio). Contract AT-33-1-GEN-53. J. Inorg. Nucl. Chem., 28: 2193-9(Oct. 1966). (MLM-1292J; CONF-650902-16).

Research quantities of ^{234}U of high isotopic purity can be obtained from ^{238}Pu aged 1 yr or more. A 3-year-old ^{238}Pu sample containing 2% ^{234}U was processed. The uranium was separated from the bulk of the plutonium by anion exchange in 7.2N nitric acid. Hexone extraction from a high nitrate salt-low nitric acid medium quantitatively recovered the uranium from plutonium and most inert impurities. Anion exchange in both nitrate and chloride media was used for final purification. Nearly 2g (90% yield) of ^{234}U was recovered, contaminated by less than one part plutonium per million. Emission spectroscopy showed only background levels of other impurities. The isotopic purity was determined to be 99.6%. (auth)

45804 LIQUID-LIQUID EXTRACTION OF CERTAIN TRIPOSITIVE TRANSPLUTONIUM IONS FROM SALTED NITRATE SOLUTIONS WITH A TERTIARY AND QUATERNARY AMINE. Horwitz, E. P.; Bloomquist, C. A. A.; Sauro, L. J.; Henderson, D. J. (Argonne National Lab., Ill.). J. Inorg. Nucl. Chem., 28: 2313-24(Oct. 1966).

The distribution coefficients of Am(III), Cm(III), and Cf(III) were measured from Li, Mg, Ca, Al, and Fe(III) nitrate solutions using a high-molecular-weight tertiary and quaternary amine. The distribution coefficient of Am(III) was measured for the tertiary and quaternary amine systems as a function of the diluent, aqueous acid concentration, extractant concentration, and aqueous nitrate concentration. Separation factors for Cm(III)/Am(III), Cf(III)/Am(III), Es(III)/Cf(III), and Eu(III)/Am(III) were determined for the two amine systems. The quaternary amine was shown to be a superior extractant for the transplutonium (III)ions compared to the tertiary amine. (auth)

45805 ACIDIC ORGANOPHOSPHORUS EXTRACTANTS. I. EXTRACTION OF LANTHANIDES BY MEANS OF DIALKYL PHOSPHORIC ACIDS: EFFECT OF STRUCTURE AND SIZE OF ALKYL GROUP. Kolarik, Z.; Pankova, H. (Nuclear Research Inst., Czechoslovak Academy of Science, Rez, Czech.). J. Inorg. Nucl. Chem., 28: 2325-33(Oct. 1966).

The separation efficiency of dialkyl phosphoric acids for lanthanides does not depend much on structure, nor on the size of the alkyl group. The extraction efficiency is considerably lowered by branching of the alkyl group; for the same structure it is only insignificantly affected by an increase in the number of carbon atoms in the alkyl group. (auth)

45806 TWO MONO-OCTYL PHOSPHINIC ACIDS, (R)(H)PO(OH), AS EXTRACTANTS FOR METALLIC CATIONS. SELECTED M(II), M(III), AND M(VI) TRACER STUDIES. Peppard, D. F.; Mason, G. W.; Andrejasich, C. (Argonne National Lab., Ill.). J. Inorg. Nucl. Chem., 28: 2347-59(Oct. 1966).

Hydrogen ion dependencies and extractant dependencies of the extraction of M(III) elements, represented by Ce^{3+}, Pm^{3+}, Eu^{3+}, Tm^{3+}, Lu^{3+}, and Y^{3+}, and of M(II) and M(VI) elements, represented respectively by Ca^{2+} and UO_2^{2+}, into a benzene solution of a mono-octyl phosphinic acid from an aqueous acidic chloride phase, 1.00F(NaCl + HCl), were determined radiometrically. The two mono-octyl phosphinic acids studied as extractants were n-octyl phosphinic acid, $(n\text{-}C_8H_{17})(H)PO(OH)$, H[(O)(H)P], and 2-ethyl hexyl phosphinic acid, $(2\text{-}C_2H_5 \cdot C_6H_{12})(H)PO(OH)$, H[(EH)(H)P]. The observed stoichiometries are represented as $M_A^{+P} + q(HY)_{x_0} \rightleftharpoons M(H_{qx-p}Y_{qx})_0 + pH_A^+$, q being a function of Z for lanthanides (III) and also differing for the two extractants. For M(III), q ranges from 3.0 to 2.2; for Ca(II) from 2.5 to 2.7; and for U(VI), i.e. UO_2^{2+}, from 2.1 to 2.3. The value of x, at 0.1F in dry benzene, approaches 2.5 for H[(EH)(H)P] and 2.7 for H[(O)(H)P]. Values of K_s, defined by, $K_s = K[H^+]^P/F^q$, where K is the observed distribution ratio for M^{+P} in the system with hydrogen ion concentration, $[H^+]$, and extractant concentration, F, are reported for Pm(III), Am(III), and U(VI) and compared with the corresponding K_s values in the analogous di n-octyl phosphinic acid, H[DOP] system. The pK_A values in 75% ethanol are included for these three extractants. Plots of log K vs. Z for all lanthanides [III] except Gd extracted under a fixed set of conditions show that the average separation factor for adjacent elements in the region $60 < Z < 71$ increases with decreasing F of the extractant. (auth)

45807 STUDIES ON THE AMMONIUM-LACTATE ELUTION OF TRACE LANTHANIDES. Bruecher, E.; Szarvas, P. (Kossuth Univ., Debrecen, Hungary). J. Inorg. Nucl. Chem., 28: 2361-9(Oct. 1966).

According to ion-exchange equilibrium and diffusion-rate investigations in the course of the separation of trace lanthanides on a cation-exchange column by ammonium lactate elution, the charge of the lanthanide ions diffusing in the resin phase, decreases abruptly from 3 to a value around 2 above a certain ammonium lactate concentration, owing to the formation of lactate complexes. This decrease in charge takes place at lower and lower ammonium lactate concentrations as the atomic number of the rare earth element increases. The most important ion-exchange reaction taking place in the course of the separation is as follows: $\overline{LnL^{2+}} + 2NH_4^+ \rightleftharpoons LnL^{2+} + 2\overline{NH_4^+}$. For a flow rate of 1 cm/min of the eluant, used for the separation, the rate of the ion-exchange process is determined by diffusion through the Nernst boundary layer, which practically does not influence the separation factors. The values of these factors are predominantly determined by the stability constants of the LnL_2^+ and LnL_3 complexes and by the affinity of the LnL^{2+} ions for the resin phase. (auth)

45808 HYDROUS OXIDES AND THEIR CATION EXCHANGE PROPERTIES. II. STRUCTURE AND EQUILIBRIUM EXPERIMENTS. Heitner-Wirguin, C.; Albu-Yaron, A. (Hebrew Univ., Jerusalem). J. Inorg. Nucl. Chem., 28: 2379-84(Oct. 1966).

The structure of two cation exchangers, hydrous thorium oxide (THO) and hydrous titanium oxide (TiHO), was studied by thermogravimetric measurements, infrared spectra, and x ray diffraction. The data suggest that the exchangers have the general formula $MeO(OH)_2 \cdot nH_2O$, are amorphous at room temperature, and lose weight on heating due to loss of interstitial and chemically bound water. The steep decrease in capacity of THO samples at high temperature is due to the beginning of crystallization. Distribution coefficients were evaluated for a series of cations with both exchangers. (auth)

45809 PURIFICATION OF RADIOISOTOPE ^{65}Zn BY ION-EXCHANGE CHROMATOGRAPHY. Bujdoso, Erno; Miskei, Mihaly; Ormos, Gyorgy (Femipari Kutato Intezet, Budapest). Kohasz. Lapok, 99: 138-40(1966). (In Hungarian).

High-purity ^{65}Zn was separated from various impurities in hydrochloric acid solutions by ion-exchange chromatography on Varion AP resin using ^{60}Co and ^{110}Ag as trac-

ers. Metal impurities were eluted with various concentrations of HCl and were identified by their γ spectra. Alkali metals, alkaline earths, rare earths, Sc, Y, V, Cr, Hf, Al, ^{110}Ag, and traces of ^{65}Zn were removed by 8M HCl. Zr, Mn, ^{60}Co, and Np were separated by 4M HCl, while Cu, W, and Ga responded to 1.5M HCl. Fe was eluted by 0.1M HCl giving a final yield of 99.99% ^{65}Zn. (P.C.S.)

45810 ANION EXCHANGE SEPARATION OF UZ, UX_2 FROM UX_1 IN NITRIC ACID-METHANOL MEDIUM. Sun, I-liang; Teng, Kun-chieh; Chung, Shih-chow. Pei Ching Ta Hsueh Hsueh Pao, 11: No. 1, 60-4(June 1965). (In Chinese).

A rapid anion exchange method for the separation of ^{234}Pa and ^{234m}Pa from their parent ^{234}Th was devised. When ten ml of 90% methanol-10% 10 M nitric acid, containing carrier-free ^{234}Th pass through a small ion-exchange column filled with a strong base anion exchange resin Zerolit FF (nitrate form, <200 mesh, 2.8 cm × 0.38 cm^2), ^{234}Th is exchanged to the resin phase. After reaching equilibrium with their parent, ^{234}Pa and ^{234m}Pa can be periodically eluted down the column with a mixed solvent of 90% methanol-10% 10 M nitric acid. The radiochemical purity of the separated isotope can be considerably increased by the application of a second ion-exchange column, filled with the same resin (nitrate form, 2.5 cm × 0.13 cm^2) and connected in series with the first column. (JPRS)

45811 SEPARATION OF RARE EARTHS AND THORIUM BY ANION EXCHANGE RESIN IN THE CITRATE FORM. Tang, Jen-huan; Hsu, Hsiu-chen; Yang, Jui-kang. Pei Ching Ta Hsueh Hsueh Pao, Tzu Jan Ko Hsueh, 11: No. 1, 99-106(1965). (In Chinese).

An ion exchange method was developed for the separation of 45 to 55 mg of rare earths and 10 to 20 micrograms of thorium with the anion exchange resin in the citrate form. By controlling the concentration of citric acid to ≥1% and the pH value of the eluent to ≥2.5, and by controlling the quantity of ions to be separated, it was found that the amount of citrate ion required to form anionic complexes with thorium was not sufficient to do so with the remainder of ions studied. Therefore, thorium was retained on the resin bed, while the rare earths passed through easily. It was possible to complete the separation within two to three hours using a small bed 3.0 cm in length and 0.44 cm in diameter. (JPRS)

45812 EXTRACTION OF PLUTONIUM WITH N-BENZOYL-PHENYL-HYDROXYLAMINE. Cristallini, O.; Dupetit, G. A.; Flegenheimer, J. (Comision Nacional de Energia Atomica, Buenos Aires). Radiochim. Acta, 5: 181-5(July 1966).

The extraction of plutonium from aqueous solutions was studied by means of a cupferron analog, N-benzoylphenylhydroxylamine (BPH), dissolved in chloroform. Plutonium in the tetravalent state can be extracted from HCl-citric acid solutions in the presence of $NaNO_2$ in the p_H range from 0 to 4.3. For a 0.4 BPH concentration the maximum distribution coefficient is 4×10^3 at a p_H of 1.2. Alpha-emitters that are not tetravalent, U(VI), Np(V), and Am(III), are not extracted under these conditions. Pu(IV) can be extracted from $HClO_4$-citric acid solutions with distribution coefficients higher than 250 in the range between 4.5M acid and p_H 4.7, the maximum value being 3.5×10^3 at p_H 0.25. The influence of other variables on the distribution coefficient, such as stabilizing agents ($NaNO_2$, $K_2Cr_2O_7$), contacting time, and the concentration of BPH in the organic phase, was studied. (auth)

45813 REACTOR FUEL PROCESSING. Volume 9. Number 3. Lawroski, Stephen (ed.). One of the five Quarterly Technical Progress Reviews published for the Division of Technical Information, USAEC. Argonne National Lab., Ill., Summer 1966. 59p. GPO $0.70 Domestic, $0.90 Foreign.

A review on technical progress in fuel processing is divided into five sections: commercial aspects of fuel processing; research and development on aqueous processing; research and development on nonaqueous processing; waste disposal; and production of uranium, thorium, and plutonium, and their compounds. Separate abstracts were prepared for sections I, II, IV, and V. Section III is divided into two parts dealing with volatility and compact pyrochemical processes, and separate abstracts were prepared for each part. (B.L.M.)

For abstracts of individual sections see: 45677, 45814–45817, and 47087.

45814 COMMERCIAL ASPECTS OF FUEL PROCESSING. Mecham, W. J.; Jonke, A. A. Reactor Fuel Process., 9: 137-46(Summer 1966).

Certain aspects of AEC operations relating to fuel processing plans are briefly reviewed. The findings of studies carried out to determine the comparative costs of processing fast reactor fuels by 1980 by either aqueous or nonaqueous processes are reviewed. The unit-cost summaries for different type fuels and for different processes are tabulated. The economic aspects of radioactive-waste storage from the AEC fuel-processing plants are presented. The use of Pu and the long-range economics of nuclear fuel costs related to its use are reviewed in some detail. (36 references). (B.L.M.)

45815 RESEARCH AND DEVELOPMENT ON AQUEOUS PROCESSING. Stevenson, C. E.; Paige, D. M. Reactor Fuel Process., 9: 147-56(Summer 1966).

Improvements that were made in the Idaho Chemical Processing Plant for recovery of U from Zircaloy-clad Zr–U alloy elements are described. The main process innovation is the use of a dibasic aluminum nitrate (DIBAN) in the scrubbing column of the extraction phase rather than $Al(NO_3)_3$ to permit extraction at reduced salting strength and with a 10% rather than a 5% TBP extractant. Solvent extraction processes for recovery of ^{237}Np from irradiated fuels, for transplutonium elements, and for actinide recovery from nuclear detonations in salt are reviewed. Ion exchange as an alternative to precipitation process for final Pu recovery is proposed. Plant and equipment design and operation are discussed in detail, and flow sheets for the processes discussed are presented. (22 references). (B.L.M.)

45816 VOLATILITY PROCESSES. Barghusen, J. J.; Mecham, W. J. Reactor Fuel Process., 9: 157-64; 168 (Summer 1966).

A review is presented of recent developments in volatility processes for highly enriched fuels; slightly enriched fuels, both UC and UO_2; and fuel and blanket of a molten-salt thermal reactor. Special consideration is given to fluid-bed fluorination of low-enrichment UO_2 fuel pellets and to operations for the separation of U and Pu arising from processing of this fuel. The properties of UF_6 and the fluoride complexes of Pu and Pa with other metals are reviewed. A brief discussion of the use of ClF_3 for reactor fuel processing is included. (43 references). (B.L.M.)

45817 COMPACT PYROCHEMICAL PROCESSES. Burris, L.; Bennett, G. A. Reactor Fuel Process., 9: 164-9(Summer 1966).

Compact pyrochemical processes for the recovery and purification of partially burned reactor fuels are reviewed for application to future fast reactor fuels and for current reactor fuels. A process based on the selective transport of U and Pu from a Cu–Mg solvent alloy to appropriate Zn–Mg alloys through a chloride salt phase is described in some detail, particularly with respect to material evaluation and equipment development. A brief review of current progress in the conversion of fluorides to oxides in a fused-salt media is presented. Continuing work on the electrorefining of Pu metal from $PuCl_3$ at Hanford and Los Alamos and some developments in fused-salt electrolysis are reviewed. (20 references). (B.L.M.)

45818 STUDY OF THE EXCHANGE EQUILIBRIA OF HEXAVALENT URANIUM ON ANION-EXCHANGE RESINS IN SULFURIC ACID SOLUTION. Ch'iu, Ling; Ling, Ta-jen; Wu, Feng-yen; P'ei, Kuang-wen. Yuan Tzu Neng, No. 3, 215-32(1965). (In Chinese).

A quantitative study was made of the exchange equilibria between $UO_2(SO_4)_2^{2-}$, $UO_2(SO_4)_3^{4-}$, HSO_4^-, and SO_4 on an anion-exchange resin. The equilibrium equations are as follows: $R_2SO_4 + 2HSO_4^- \underset{}{\overset{K_1}{\rightleftharpoons}} 2RHSO_4 + SO_4^{2-}$, $R_2SO_4 + UO_2(SO_4)_2^{2-} \overset{K_2}{\rightleftharpoons} R_2UO_2(SO_4)_2 + SO_4^{2-}$, and $R_2SO_4 + UO_2(SO_4)_3^{4-} \overset{K_3}{\rightleftharpoons} R_4UO_2(SO_4)_3 + 2SO_4^{2-}$. When the ion concentration $\mu = 0.1$, the ion exchange constant $K_1 = 15.1$, $K_2 = 220 \pm 20$, and $K_3 = 62 \pm 6$; and when $\mu = 0.30$, $K_1 = 17.4$, $K_2 = 230 \pm 25$, and $K_3 = 262 \pm 27$. From the K values, the volume percentage of ions in the resin under different experimental conditions was calculated. From the result, the conclusions of Kraus and Nelson that only $H_2SO_4^-$ and $UO_2(SO_4)_2^{2-}$ ions are found in the resin was corrected. It is indicated that the conclusion reached by Arden et al. is also incorrect. From the results of this study, it was concluded that HSO_4^-, SO_4^{2-}, $UO_2(SO_4)_2^{2-}$ and $UO_2(SO_4)_3^{4-}$ can exist in the resin and that their volume percentage depends on the experimental conditions. Increasing the pH of the solution, increasing the uranium concentration, or decreasing the ion density greatly increases the volume percentage of $R_2UO_2(SO_4)_2$ and $R_2UO_2(SO_4)_3$ in the resin; the latter two factors also increase the proportion of $R_2UO_2(SO_4)_2$ in the total uranium content in the resin. This further increases the uranium content per gram of resin. (ATD)

45819 EXTRACTION OF RARE EARTH ELEMENTS OF CERIUM SUBGROUP IN (DAMPA) DIISOAMYL ESTER METHYLPHOSPHONIC ACID–NITRIC ACID. Mikhlin, E. B.; Korpusov, G. V. (State Scientific-Research and Planning Inst. of Rare Metal Industry, USSR). Zh. Neorg. Khim., 11: 2108-11(Sept. 1966). (In Russian).

Studies on the distribution of cerium subgroup elements in diisoamyl ester of methylphosphonic acid (DAMPA)–nitric acid showed that the distribution coefficient for the rare earth does not depend much on the concentration of rare earth in aqueous solution. With the increase of HNO_3 concentration in aqueous solution the volume of DAMPA is reduced in relation to the cerium subgroup. The volume of DAMPA exceeds the volume of TBP, especially in the low-acidity aqueous phase. The partition factors of elements adjacent to cerium subgroup determined for the DAMPA extraction from the rare earth in 8M HNO_3 were higher than in TBP extraction. It was suggested that DAMPA is suitable for cerium group separation in comparatively low nitric acid concentration (8M). (R.V.J.)

45820 METHOD AND DEVICE FOR THE SEPARATION OF FISSION PRODUCTS FORMED AFTER INSERTION IN A NUCLEAR REACTOR. Schneider, Arnim; van Impe, Jean; Meyer-Jungnick, Werner (to Leybold-Hochvakuum-Anlagen GmbH). German Patent 1,220,616. July 7, 1966. Filed Aug. 28, 1964.

Irradiated ceramic fuel is reprocessed by mixing contaminated uranium oxides with a reducing metallic liquid phase, which is chosen in such a way that the fission product oxides to be separated are at least partially reduced to metals. In order to obtain a thermodynamically controllable separating procedure the initial substance is successively mixed with different highly volatile metallic admixtures in the form of halogen compounds of alkaline earth metals. The succession of the admixtures progresses in the sense of the electrochemical series from noble to less noble compounds. The metallic admixtures are evaporated under vacuum after the reaction. (Gmelin Inst.)

45821 OBTAINING URANIUM VALUES FROM BURNT LIGNITES. Meyer, Adolph E.; Goren, Mayer B. (to Kerr-McGee Oil Industries, Inc.). U. S. Patent 3,272,620. Sept. 13, 1966. Filed Feb. 25, 1964.

A process for recovering U values from mined U-bearing lignite consists of pelletizing the lignite to produce pellets at least $\frac{1}{32}$ in. in size, preparing a bed of the pellets, igniting the bottom of the prepared bed, and supplying air to the ignited lignite at the bottom of the bed at such a rate as to support combustion and to control the rate of burning. The combustion gases are passed upwardly through the bed of lignite. If the lignite is not sufficient to support combustion an auxiliary fuel is mixed with the pellets of lignite. The lignite ash is leached to produce a leach liquor containing the U values. (B.L.M.)

45822 PROCESS FOR SOLUBILIZING URANIUM VALUES. Goren, Mayer B. (to Kerr-McGee Oil Industries, Inc.). U. S. Patent 3,268,288. Aug. 23, 1966. Filed July 19, 1963.

A process for solubilizing U values in a valence state less than +6 comprises contacting the finely ground U-bearing ore with an aqueous mineral acid containing ferric ions, and/or vanadium ions in the +5 oxidation state as oxidant for the U. The leach liquor contains dissolved U, ferrous ions, and/or V ions in the +4 oxidation state. In order to reuse the leach liquor, the ferrous and/or V ions in the +4 oxidation state are reoxidized with an effective quantity of live non-spore forming, rod-shaped, motile, autotrophic oxidizing bacteria to reoxidize the ions for recycling of the solution. Directions are given for obtaining a preferred strain of the desired bacteria. (B.L.M.)

45823 PROCESS FOR PRODUCING BASIC BERYLLIUM MATERIAL OF HIGH PURITY. Maddox, Robert L.; Foos, Raymond A. (to Brush Beryllium Co.). U. S. Patent 3,259,456. July 5, 1966. Filed Oct. 16, 1964.

A process is described in which high-purity Be is extracted from solutions using bis(2-ethylhexyl)ammonium phosphate in kerosene and 2-ethylhexyl alcohol. $(NH_4)_2CO_3$ is used to strip the Be from the organic phase. The extractant and stripping agents are recycled, and the coextracted impurities are removed by precipitation. The stripped material can be calcined and sintered into high-purity BeO. (J.R.D.)

45824 METHOD FOR PROCESSING ALUMINUM-CONTAINING NUCLEAR FUELS. Thoma, Roy E. Jr.; Bennett, Melvin R.; Ullmann, Jacob W. (to U. S. Atomic Energy Commission). U. S. Patent 3,273,973. Sept. 20, 1966. Filed Mar. 31, 1964.

A method is described for dissolution of Al-containing fuels using $KF-ZrF_4$ at 658°C while bubbling HF through the mixture. The dissolved fuels are prepared in this way for recovery by fluoride volatility. (J.R.D.)

45825 PROCESS FOR REMOVING CARBON FROM MIXTURES COMPRISING CARBON AND RADIOACTIVE MATERIAL. Johnson, James Robert; Rowe, William Ellsworth (to Minnesota Mining and Manufacturing Co.). British Patent 1,043,543. Sept. 21, 1966. Filed Mar. 29, 1963.

A process for removing C from a mixture of C and radioactive material, e.g., spent fuel elements in a graphite matrix, consists of oxidizing the mixture in an atmosphere of an inert gas combined with 3 to 5 vol % oxygen at a temperature of 1550 to 1650°F. The combustion gases contain CO_2, inert gas, and volatile fission products and are passed through a refrigeration trap at about –20°C to remove the fission products of greatest volatility, through a solution of pyrogallate to remove traces of O_2, and then over a hot Cu coil trap to remove I, Te, and Ru fission products. The residual gas is bubbled through a saturated lime water solution in a continuous precipitator to precipitate $CaCO_3$ containing the β-active carbon and thence through a cold trap at about –100°C to remove radioactive Xe and Kr. (B.L.M.)

45826 REMOVAL OF RADIOACTIVE MATERIAL FROM MILK BY ION EXCHANGE. Malick, Emil A. (to Phillips Petroleum Co.). U. S. Patent 3,271,163. Sept. 6, 1966. Filed Jan. 28, 1963.

An ion exchange method for the removal of radioactive contaminants, particularly ^{90}Sr, from milk consists of concentrating the milk by freezing out a slurry of ice crystals in mother liquor and passing the slurry through a filtration zone from which a stream of mother liquor is withdrawn as a first product stream, which is then passed through the ion exchanger zone that is presaturated with ions of Ca, K, and Na. The crystals and any remaining mother liquor from the filtration zone are passed into a melting zone to

melt the crystals. A portion of the melt is withdrawn as a second product stream before the remainder of the melt is passed countercurrently to the movement of crystals through a reflux zone. The concentrated milk is reconstituted after passage through the ion exchange zone to yield a product milk having a lower radioactive material concentration than that obtainable by passing unconcentrated milk through the ion exchange zone. (B.L.M.)

ENGINEERING

General

Refer also to abstracts 46531–46535, 46537, 46542, 46543, 46545–46550, and 46985.

45827 (LA–3500) PULSED FIELD SKIN EFFECT CALCULATIONS FOR CYLINDRICAL CONDUCTORS. Baker, D. A.; MacRoberts, M. D. J.; Mann, L. W. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). May 1966. Contract W-7405-eng-36. 99p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Calculations are described of pulsed magnetic field penetration into cylindrical conductors. A computer code was developed which calculates magnetic field penetration, surface electric field, and resistive damping in a capacitively driven RLC circuit including effects of a time varying skin depth. A set of dimensionless curves is given which allows one to estimate these factors. Generalizations of the method are discussed and an example is given. (auth)

45828 (UCRL–14737) THERMAL STRESSES IN INFINITE FLAT PLATES. Johnston, Bradley M. (Lawrence Radiation Lab., Univ. of California, Livermore). June 30, 1966. Contract W-7405-eng-48. 52p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

Stress caused by heat generation in infinite flat plates is investigated analytically and numerically by well-known methods. It is shown how these methods can be used to solve multiple-plate problems. The numerical method used allows one to consider very high—even instantaneous—heat-generation rates. A comparison is given between the analytical and numerical solutions. The problems are arranged in order from the simple to the more complex, and the methods, both analytic and numerical, are explained in detail so that an engineer with a minimum of mathematical training can understand them and use the results to solve similar problems. (auth)

45829 (UCRL–70034) ANALOG COMPUTER STUDY OF CURRENT RISE TIME IMPROVEMENTS FOR 2X CAPACITOR BANK. Edson, David J. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 22p. (CONF-661016–7). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

The possibility of decreasing the current rise-time of an existing capacitor bank/quadrupole load coil combination by the addition of high-frequency, harmonically related energy storage sections was studied. An approach was found in which the LARC computer was used to obtain attenuator settings for a PACE analog computer, used for solving the differential equations. Detailed adjustments of the current wave shape were possible with this approach. (auth)

45830 COMPARISON OF DYNAMIC AND STATIC POWER CONVERSION SYSTEMS FOR UNDERSEA MISSIONS. Sternlicht, B.; Bjerklie, J. W. J. Eng. Power, 88: 323–33 (Oct, 1966).

A modular approach to power and total-energy systems for undersea missions is discussed. Vehicular, portable, and stationary power plants of various power levels (1–100 kw(e)) and duration (10–1000 and >1000 hr) are considered. Both dynamic (open and closed Brayton and Rankine cycles) and static (battery, fuel cell, and thermoelectric) systems utilizing chemical and nuclear heat sources are compared. The comparison is based on a rating of a number of criteria for which weighing factors have been selected, e.g., weight, size, reliability, serviceability, applicability, development time, and cost. Several types of power systems will be necessary for undersea missions. Isotope-thermoelectrics are well suited for extremely low-power-level, long-duration missions. Batteries appear to be satisfactory power sources for low kilowatt hours, chemical-dynamic and fuel cell for intermediate kilowatt hours, and isotope-dynamic for high kilowatt hours. The dynamic systems have the advantage that they can be used with several heat sources, (e.g., chemical, isotope, and reactor). Recommendations are made for component development to allow early availability of power sources for undersea missions. (auth)

45831 POSSIBILITIES OF DECONTAMINATION OF WATERS WITH RAPID FILTRATION PLANTS. Bernhardt, H.; Hartmann, H.; Baumgaertel, F. (Technische Hochschule, Brunswick). Vom Wasser, 29: 341–417 (1962). (In German).

Procedures for purification of radioactively contaminated water in Germany by means of rapid filtration equipment that is applicable for large amounts of water (flow rates of 1000 m^3/hr) are reviewed. These methods include (I) chemical procedures, such as flocculation with Al salts, Fe salts, Fe or Al salts with added clays, Mn salts, or organic polyelectrolytes, phosphate precipitation, Na carbonate softening; (II) exchange procedures with inorganic, naturally occurring ion exchangers, organic, naturally occurring ion exchangers, or synthetic organic ion exchangers; (III) physicochemical procedures, such as electroionic separation on metal particles or Fe chips; (IV) biological procedures, such as slow filtration through sand, activated sludge processes, or filter percolation procedures; and (V) physical procedures, such as electrodialysis or distillation. The chemical procedures are the most adaptable but their effects are limited, and within certain limitations, inorganic naturally occurring ion exchangers or the physicochemical procedures are very suitable for purification of contaminated waters. Slow filtration through sand is very rarely used because it has limited decontamination effect. In large waterworks, activated sludge processes and filter percolation procedures are impractical. 87 references are cited. (BBB)

45832 DEVELOPMENTS IN THEORETICAL AND APPLIED MECHANICS. VOLUME 2. Proceedings of the Second Southeastern Conference on Theoretical and Applied Mechanics, Atlanta, March 5–6, 1964. Shaw, W. A. (ed.). New York, Pergamon Press, 1965. 662p. $22.50. (CONF-256).

Included are 37 papers presented at the conference on various aspects of solid and fluid mechanics. (M.O.W.)

Applications of Nuclear Explosions

Refer also to abstracts 45570 and 45879.

45833 (UCRL–14778) RELEASE OF RADIOACTIVITY FROM NUCLEAR CRATERING EXPERIMENTS. Miskel, John A. (Lawrence Radiation Lab., Univ. of California, Livermore). Aug. 26, 1966. Contract W-7405-eng-48. 12p. (CONF-660920–6). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 1st International Congress of the International Radiation Protection Assn., Rome, Italy.

The use of nuclear explosives for excavation purposes results in the release of radioactivity to the atmosphere. The fraction of the total amount of a given species produced and released to the atmosphere depends on the chemical properties of the species and on the nature of the cratering process. Data obtained from several nuclear cratering experiments indicate that the fractions of the more volatile species released are relatively insensitive to the cratering phenomenology, whereas the fraction of the refractory species released are highly dependent on it. The controlling factor for the refractory species appears

to be the filtering action of the earthmound raised in the initial stages of the crater formation. Two different cratering processes have been studied experimentally. In one, an erosional crater was formed which resulted in essentially no filtering of the debris during the release; in the other, two craters were formed, one with "normal" filtering and one with a much thicker filter bed than optimum. The results of these experiments are presented to document the effect of the filter action on the various radionuclides. The hazard evaluation for engineering programs involving nuclear excavations can be divided into two parts: first, the close-in area which is of interest with respect to the time-delay of further work on the engineering project; and second, the long-range distribution of the radioactive materials with respect to the entry of radiation into the outside world. Data from the excavation experiments to date indicate that the close-in fallout is dependent primarily on the chemical species involved; the long-range concentrations appear to be independent of the detailed nature of the source, but depend primarily on the atmospheric dissipative processes once the early fallout has occurred. (auth)

45834 FRACTURING OIL SHALE WITH NUCLEAR EXPLOSIVES FOR IN-SITU RETORTING. Lekas, M. A. (Atomic Energy Commission, Berkeley, Calif.); Carpenter, H. C. Quart. Colo. Sch. Mines, 60: No. 3, 7-30(July 1965).

Preliminary concepts are discussed for using either fission or fusion (preferably fusion which results in fewer contamination problems) nuclear devices to fracture oil shale deposits. Nuclear devices would be used to create multiple NTU retorts underground for extracting the oil from the shale. The shale would be burned in underground retorts with the oil being collected in the lower part of the collapse chimney and drawn off through drainage drifts or wells. A concept of a commercial scale operation based upon a fragmentation array in a 1000 ft thick shale bed is presented. Various specifications and costs are presented for several sizes and types of nuclear devices. (B.L.M.)

Facilities and Equipment

45835 (NAA-SR-Memo-11992) SCTI: BOLTED FLANGE CONNECTIONS IN HIGH TEMPERATURE-HIGH PRESSURE STEAM SERVICE. DiPol, C. V. (Atomics International, Canoga Park, Calif.). June 10, 1966. Contract AT(11-1)-Gen-8. 35p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Bolted flange connections in high temperature-high pressure service at the Sodium Components Test Installation (SCTI) are described. Review of various government and national society regulations and codes determined that the ASA "Code for Pressure Piping", ASA B31.1, is the applicable design code. The system was initially designed in accordance with this code. Current industry practices relative to bolted connections in extreme steam service were reviewed. The original design and installation conformed with code requirements and/or current industry practice, except in the areas of gasket material; bolt material; bolt preload; and in the use of bolted joints. Code requirements relative to gasket and bolting material are poorly defined, and current industry practice is to avoid bolted connections in extreme steam service insofar as possible. Thermal stress considerations in piping and in uninsulated flanges were evaluated, and the stress levels encountered in the system should not be a significant cause of leakage in properly bolted joints. The basic cause of the experienced steam leaks appeared to be inadequate bolting. Engineering recommendation to assure sustained leak free operation is to eliminate bolted flange connections and go to an all welded system. Alternate modifications to the existing bolted connections were developed for evaluation and decision. These alternate modifications will significantly reduce the leakage potential but will not remove the possibility of future leaks at the joints. (auth)

45836 (ORNL-P-2356) MANIPULATOR MAINTENANCE PROGRAM AT OAK RIDGE NATIONAL LABORATORY. Dice, D. T.; Jenness, R. G.; Wicker, C. D. (Oak Ridge National Lab., Tenn.). [nd]. Contract W-7405-eng-26. 13p. (CONF-661001-20). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 14th Conference on Remote Systems Technology, Pittsburgh, Pa.

The volume of master-slave manipulator maintenance at Oak Ridge National Laboratory has necessitated the establishment of a repair facility and organization of a specially trained group of craftsmen. Emphasis on cell containment requires the use of manipulator boots and development of precise procedures for accomplishing the maintenance of 237 installed units. To provide the most economical type of preventive maintenance a very satisfactory computer programmed maintenance system was established. (auth)

45837 (UCRL-14733) ROOF SLAB DOORS FOR HOT CELLS. Stearns, E. H. (Lawrence Radiation Lab., Univ. of California, Livermore). Mar. 3, 1966. Contract W-7405-eng-48. 6p. (CONF-661001-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 14th Conference on Remote Systems and Technology, Pittsburgh, Pa.

It has been found that a minimum amount of contamination is released from hot cells if material and equipment is transferred through the roof of the cell. A manually operated roof slab door is described which permits ready access into the hot cell. (B.G.D.)

45838 (UCRL-70017) MODULAR DESIGN 300-kw D-C POWER SUPPLY SYSTEM. Polzin, Glen D.; North, G. Gordon (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 13p. (CONF-661016-11). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

The power supply system was designed in two units of modular construction. One, the rectifier unit, was water cooled and built for zero side clearance installation. Thus, it is quiet enough and sufficiently compact to permit installation close to the experiment to hold low voltage dc busing to a minimum. The other, an ac power controller unit, was built for installation near the source of power, preferably adjacent to the substation switchgear. Control was accomplished with a servo-driven induction voltage regulator. A selector switch commands either voltage regulation to ±0.15% or current regulation to ±0.3%. All low-current circuitry is plug interconnected to simplify moves. A removable control panel is incorporated into the design to facilitate remote operation. Many other convenience and safety features are incorporated. The modular design also permits the use of the rectifier unit without the controller unit when on-off control is satisfactory. A number of unregulated rectifier units may also be inserted in series with a regulated system to increase voltage compliance where necessary. This combination gives limited regulation range at much higher powers and at reduced equipment costs. The first year of operating experience with these systems has been highly satisfactory. (auth)

45839 (UCRL-70020) CURRENT-REGULATED D-C SUPPLIES WITH HIGH EFFICIENCY AND LOW COST. Robinson, J. W. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 14p. (CONF-661016-12). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

A class of current-regulated d-c power supplies is described which should become available commercially in the near future. These supplies for use on magnetic field coils offer very good regulation and stability, ripple frequency independent of the line frequency with 1-2 kc easily obtained, ripple magnitude independent of operating point, and cost substantially lower than conventional supplies. The main difference between the power supplies to

be discussed and familiar SCR or transistor-regulated supplies is that the controlling devices are operated in a saturated switching mode. This allows the use of relatively inexpensive components and also results in a supply with a high power conversion efficiency over its entire operating range. (auth)

45840 (UCRL-70029) PROGRAMMED MECHANICAL DESIGN OF AIR-CORE SOLENOIDS CONSTRUCTED FROM HOLLOW CONDUCTOR. Harvey, Arthur R. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 12p. (CONF-661016-17). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

A brief description is given for approaching computerized solutions for hollow-conductor solenoids, with the emphasis placed on the role of the conductor. (M.O.W.)

45841 (Y-1552) OIL RECLAMATION USING MOLECULAR SIEVES. DeMonbrun, R.; Speas, I. G.; Weathersby, W. E. (Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant). Sept. 29, 1966. Contract W-7405-eng-26. 60p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

A study was made of the reuse of various types of organic oils and tri-aryl phosphate ester fluids used in large volume at the Oak Ridge Y-12 Plant. It was concluded that molecular sieve desiccant affords an economical means of obtaining highly purified stocks for reuse. A simple regenerative equipment arrangement has proved to be suitable for the purification of a wide range of lubricating, hydraulic, and insulating fluids. (auth)

45842 DOSE DISTRIBUTION IN THE ARGONNE HIGH-LEVEL GAMMA IRRADIATION FACILITY. Swope, H. Gladys (Argonne National Lab., Ill.). Atompraxis, 12: 398-401(Aug. 1966).

The Argonne High Level Gamma Irradiation Facility uses spent fuel rods from the Materials Testing Reactor. Samples are placed in cylinders which are then placed in the irradiation rack. The flux varies within the cylinder as well as in the various rack positions, the flux being highest at the center. Most work involves the irradiation of canned food. Five cans of food will fit into a cylinder. An experiment was performed to determine the variation of the dose rate within a single can about 5 in. high. The dose rate within the cylinder varied from 40 to 100%. When five cans were used in the cylinder the dose rate in the bottom can varied from 70 to 120%; in the next can from 86 to 110%; in the middle or center can from 92 to 102%; in the next can 82 to 112%; and in the top can from 60 to 140%. These variations were found to be fairly constant regardless of the fuel rods used for any one cylinder position within the rack, but the variations had to be determined for each of the 12 cylinders. (R.C.K.)

45843 THE INSTITUTE OF APPLIED ISOTOPIC RESEARCH (INSTITUT FUER ANGEWANDTE ISOTOPENFORSCHUNG) AT BERLIN-BUCH OF THE GERMAN ACADEMY OF SCIENCES IN BERLIN. Vormum, G. Isotopenpraxis, 2: 140-5(Mar. 1966). (In German).

The Institute for Applied Isotopic Research, Berlin is described. Descriptions of the electron beam welding facility, hot cell for ^{131}I labeling of organic compounds, dry box for working in high gamma activities, a gas chromatography, laboratory, and the pump room installation for the waste water processing are included. 60 literature references are given. (F.S.)

45844 OPERATING EXPERIENCE WITH THE EBR-II FUEL CYCLE FACILITY INERT ATMOSPHERE CELL. Holcomb, W. F.; Paige, D. M.; Coleman, L. F. (Argonne National Lab., Idaho Falls, Idaho. Argonne National Lab., Ill.). Nucl. Appl., 2: 254-5(June 1966).

The fuel cycle facility of the EBR-II complex contains a shielded high-purity argon inert-atmosphere cell, which has been in operation since August 1963. During this time, the 66,000 ft^3 cell has been filled twice with argon and emptied once. Each fill was conducted by flushing the cell with approximately 100,000 standard ft^3 of argon. This reduced the oxygen content to about 1% for the first fill and about 0.7% for the second fill. The gas purification system then further reduced the oxygen content of the cell gas. Continuous operation of the gas purification system can maintain an atmosphere with oxygen impurities of 8 ppM and water impurities of 5 ppM at a cell inleakage rate of 0.24 standard ft^3/hr of air while operating the cell at a negative pressure of 2 to 4 in. of water. (auth)

45845 E-18 PENETROMETER MODIFICATIONS (Engineering Materials). (Oak Ridge Gaseous Diffusion Plant, Tenn.). (CAPE-1243).

55 drawings.

The E-18 filter testing penetrometer was originally designed to test only the filter media at a single air flow of 100% of the rated filter capacity. Penetrometer modifications permit testing of the filters at 20% or 100% of the rated flow and include filter frame and gasket leakage in filter efficiency test results. Drawings are included for the filter chamber modifications, variable flow controller, and the variable flow orifice. (F.S.)

45846 ARGONNE TEST STRIP PERISCOPE (Engineering Materials). (Argonne National Lab., Ill.). (CAPE-1481).

1 drawing

A periscope adapted to a reflecting objective was designed for use with a hydrogen bubble chamber. The first image relay consists of a singlet field lens element near the paraboloid objective and beam splitter, followed by two separate lens groups having 4 elements in each group. A real image is formed 1403 mm from the paraboloidal vertex. The second relay contains 2 lens groups each having 3 elements, and a singlet element with a back focus of 10 mm. Total distance from the paraboloidal vertex to the final flat, telecentric image is 2500 mm. The double relay system operates at a magnification of 1:1 which results in a final image diameter of 61.6 mm. The overall system has an effective focal length of 35.3 mm. (F.S.)

45847 ALIGNMENT INTERFEROMETERS (Engineering Materials). (Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant). (CAPE-1475).

12 drawings.

Interferometers used to measure straightness of machine tool slides and to separate out-of-straightness from angular error are described. The interferometers consist of light sources, light collimators, beamsplitters, tilt plates, eye pieces, reference mirrors, and leveling devices. (For details see TID-4100 Suppl. 37). (F.S.)

45848 BAKEABLE VALVE, 12 IN. MODEL II (Engineering Materials). (Lawrence Radiation Lab., Univ. of California, Livermore). (CAPE-1479).

31 drawings.

The valve consists of a large hydraulic cylinder operating through a welded bellows which moves the carrier plate and gate in a simple rectilinear path. Valve closure is accomplished by rollers on ramps near the end of the carrier plate travel. The gate carries a copper disk with the seal surface machined at its outer periphery. The seal is accomplished against a surface on a mating member external to the valve assembly. A rectangular Al foil seal flange permits removal of all valve components for service or replacement without removing the valve from its system. (F.S.)

45849 ISOTOPE STORAGE DEVICE. Lammers, C. Jay. U. S. Patent 3,259,748. July 5, 1966. Filed Jan. 18, 1963.

A device used in storing medical-type radioisotopes in a conventional refrigerator is described. The isotopes are carried in protein, fat, or other materials that degenerate at room temperature. Use of lead shielding is minimized by a tilting arrangement resulting in a sufficient thickness of lead between the isotopes and medical personnel at all times. The storage device automatically assumes a safe position after isotope removal. Cavities are supplied for multiple radioisotopes. (F.S.)

45850 DIMENSIONAL INSPECTION BENCH FOR PARTS HAVING CYLINDRICAL BODIES. Brebant, Charles (to Commissariat a l'Energie Atomique). U. S. Patent 3,264,741. Aug. 9, 1966. Priority date Apr. 27, 1962, France.

A dimensional inspection bench for measuring parts having cylindrical bodies and circular cross sections such as reactor fuel elements is described. Profiles of rods having variable diameters and lengths can also be measured. The bench is remotely controlled and is easily disassembled for decontamination. (F.S.)

45851 MOVING WALL ELUTRIATOR. Postma, Arlin K. (to U. S. Atomic Energy Commission). U. S. Patent 3,269,536. Aug. 30, 1966.

An elutriator in the form of a vertical settling chamber, the walls of which are formed of a plurality of upwardly moving belts enclosing a long vertical space, is described. The particles to be separated from one another according to size are introduced in a stream of gas entering the elutriator at a mid-region in the length and a vacuum is applied at the top of the elutriator. Since the belts forming the walls move upwardly as does the gas carrying the particles, the drag of the walls on the gas is eliminated, the gas velocity is uniform across the space between the walls, and so there is a superior separation of the particles according to size. (AEC)

45852 IMPROVEMENTS RELATING TO GRABS. Stephens, John Eskett (to Fairey Engineering Ltd.). British Patent 1,041,641. Sept. 7, 1966. Filed Jan. 21, 1964.

Grabs or grapples adapted to be lowered into a confined channel, such as the channel in the core of a reactor, to retrieve an object, such as a fuel element stringer are described. The equipment may also be used in lowering a fuel element into a channel. The apparatus is comprised of at least 2 movable jaws for grabbing, a proximity sensing device with a signal, means for actuating the jaws, a latch to lock the jaws to the object, and a signal to denote when the jaws are latched. The equipment can be employed under conditions of high temperature and/or high pressure. (F.S.)

Heat Transfer and Fluid Flow

See also PHYSICS — Fluid Physics and Thermodynamics

Refer also to abstracts 46541 and 47034.

45853 (AD–639219) BOUNDARY LAYER ANALYSIS OF TWO-PHASE (LIQUID-GAS) FLOW OVER A CIRCULAR CYLINDER AND OSCILLATING FLAT PLATE. Goldstein, M. E.; Yang, Wen-Jei; Clark, J. A. (Michigan Univ., Ann Arbor). Jan. 1966. Contract AF33(657)-8368. 359p. (ARL–66-0010(Pt.4)) CFSTI $7.00 cy, $1.75 mn.

An analysis was carried out of a two phase (gas/liquid) flow over a circular cylinder and over an oscillating flat plate. The flow is assumed two dimensional and gravity, vaporization of the liquid phase, and compressibility are ignored. The liquid is assumed to be in the form of small drops far upstream from the body. The liquid film which forms on the surface of the body due to drop impingement is analyzed extensively. In the case of the cylinder the analysis is started from the full incompressible Navier-Stokes and energy equations in the film which are simplified by using dimensional arguments. The order of magnitude of the physical properties of the fluids is taken to be those of air/water mixtures. The analysis is carried out for two ranges of a parameter appearing in the problem. For low values of the parameter the liquid drop trajectories deviate appreciably from straight lines and are obtained numerically. For the flat plate the boundary layer approximations are assumed to hold a priori in the film. The plate is taken to be oscillating sinusoidally in its plane with small amplitude and small frequency; and the drops are assumed to move in straight lines. After appropriate changes of variable the solutions to the governing equations and boundary conditions are carried out by a series expansion technique which results in a series of ordinary differential equations which have been solved numerically on a 7090 computer. The solutions are used to calculate velocity and temperature profiles in the film and also such physical quantities as local film thickness, local Nusselt Number, and local skin friction. The analysis shows that in general there is a significant increase in heat transfer as well as skin friction over what would be obtained from a single component gas flow. In the case of the flat plate only a very small permanent change in the heat transfer was found due to the oscillations. In the case of the cylinder a peaking in the heat transfer, film thickness and skin friction was found with respect to the parameter E^2 (the product of the volume fraction of the liquid in the free stream, squared, and the diameter Reynolds number based on liquid properties). The peaking occurs at a value of this parameter of about unity. The theoretical prediction compares favorably with the experimental results of Acrivos et al. (auth)

45854 (AE–238) VOID MEASUREMENTS IN THE REGIONS OF SUB-COOLED AND LOW-QUALITY BOILING. PART I. LOW MASS VELOCITIES. Rouhani, S. Z. (Aktiebolaget Atomenergi, Stockholm (Sweden)). July 1966. 48p. Dep. mn.

By the application of the (γ,n) reaction to boiling heavy water, void volume fractions were measured in a vertical annular channel with 25 mm OD and 12 mm ID at a heated length of 1090 mm. The experiments covered pressures from 10 to 50 bars, mass velocities from 50 to 1450 kg/m^2-sec, heat fluxes from 30 to 90 W/cm^2, subcoolings from 30 to 0°C, and steam qualities from 0 to 15%. The results indicate noticeable effects of pressure, heat flux and even mass velocity upon the variations of void with subcooling and steam quality. A novel explanation of the mechanism of their effects was found and proved by qualitative analysis. (auth)

45855 (GEAP–5191) TRANSITION BOILING HEAT TRANSFER PROGRAM. Quarterly Progress Report No. 14, April–June 1966. (General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.). July 1, 1966. Contract AT(04-3)-189. 22p. (EURAEC–1704). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

Film boiling coefficients were measured in order to resolve differences found in previous annular test data. Increasing the distance between spacers was found to reduce the fully-developed film boiling coefficient. The droplet slip velocity for mist flow and the contribution of convection to droplet heat transfer were evaluated. (auth)

45856 (GEAP–5203) A PROGRAM OF TWO-PHASE FLOW INVESTIGATION. Quarterly Report No. 13, April–June 1966. Kroeger, P. G.; Zuber, N. (General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.). July 1, 1966. Contract AT(04-3)-189. 78p. (EURAEC–1705). Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

The dynamic behavior and the stability of a two-phase mixture with heat addition are significantly affected by the void formation in the subcooled boiling regime. It was shown in previous work that prediction of the void fraction requires knowledge of four parameters: the distribution parameter C_0, the vapor drift velocity V_{gj}, the point of incipient vapor formation z_0, and the axial temperature distribution function T^+. The effects of these parameters on the void fraction in subcooled boiling were analyzed and are presented. The distribution parameter C_0 is of major importance towards the end of the subcooled regime, where thermodynamic equilibrium is approached. The vapor drift velocity has only a minor effect in forced convection systems with high mass flow rates. The point of incipient vapor formation z_0 greatly affects the predicted void fraction in the subcooled regime. No reliable criterion for

predicting the location of this point exists at this time. It was concluded, therefore, that further work to define and predict its location is mandatory for reliable and accurate prediction of void fractions in subcooled boiling. The axial temperature distribution has been approximated by different functions that satisfy the physical boundary conditions. It appears that the precise specification of the temperature distribution is of secondary importance when compared to the need of locating properly the point of initial vapor formation z_0. The profiles used give satisfactory results when compared to available experimental data. However, final conclusion must be reserved until a method for predicting z_0 becomes available. The results of the analysis show that changing the conditions of the heated surface and the introduction of additives may have two effects on the void fraction in subcooled boiling. These effects are discussed and a method for taking them into account is presented. Satisfactory agreement is shown between predicted void fractions and recent experimental data obtained in subcooled boiling of Refrigerant-22 and of water over a pressure range of $0.22 \leq p_r \leq 0.65$ and $0.005 \leq p_r$ 0.22 respectively. (auth)

45857 CALCULATION OF SHEAR STRESSES ON WALL AND OF VELOCITY DISTRIBUTION FOR TURBULENT FLOW OF LIQUID IN CHANNELS. Ibragimov, M. Kh.; Isupov, I. A.; Kobzar, L. L.; Subbotin, V. I. At. Energ. (USSR), 21: 101-7(Aug. 1966). (In Russian).

The shear stress distribution functions for turbulent flow in a smooth, straight channel of arbitrary cross section were calculated on the basis of the turbulent flow transfer concepts. Experimental data were used to determine the constants of the functions obtained. The calculated data for the shear stress on the wall and for the velocities in eight channels of different shapes were correlated and the results are given. (G.O.Y.)

45858 TEMPERATURE DISTRIBUTION AND EFFICIENCY OF A SINGLE SHEET OF RADIATIVE AND CONVECTIVE FIN ACCOMPANIED BY INTERNAL HEAT SOURCE. Okamoto, Yoshizo (Japan Atomic Energy Research Inst., Ibaraki). Bull. JSME (Japan Soc. Mech. Eng.), 7: 751-8(1964).

When a finned heat-transfer surface is used for heat exchangers, space radiators, or nuclear fuel elements at high temperatures, in some instances the fin emits radiative and convective energy and is accompanied by an internal heat source. Previous reports have dealt with the simple behavior of a finned heat-transfer surface, but the mutual heat-transfer mechanism of fins has not yet been analyzed. An analysis of the radiative and convective surface accompanied by an internal heat source is presented. The steady state conduction equation is derived and solved numerically with a digital computer. Temperature distribution, efficiency, and the heat-transfer ratio are calculated. From the one-dimensional conduction equation obtained, the total fin efficiency Φ, radiative efficiency Φ_r, convective efficiency Φ_c, radiative heat-transfer ratio ϵ_r, convective heat-transfer ratio ϵ_0, and heat-transfer rate Q could be defined. These nonlinear equations are solved numerically by the digital computer. Under three conditions: net radiation, radiation and convection, and with an internal heat source, the parameters of the temperature Θ_r, the efficiency Φ, Φ_r, Φ_c, and the heat-transfer ratio ϵ_r, ϵ_c were analyzed. (BBB)

45859 BURNOUT EQUATION AND ON LOCATION OF BURNOUT POINTS. Silvestri, M. (CESNEF, Milan). Energ. Nucl. (Milan), 13: 469-79(Sept. 1966).

The capacity to predict the steady state critical heat flux value in two-phase flow with reasonable accuracy is now being achieved with a number of semi-empirical or empirical correlations. The prediction of burnout location, however, is much less accurate. The possibility of predicting burnout location with the CISE correlation when nonuniform heat flux distributions are applied to a vertical heated section is discussed. (auth)

45860 CONVECTIVE FIN WITH UNIFORMLY DISTRIBUTED HEAT GENERATING SOURCES. Okamoto, Yoshizo (Japan Atomic Energy Research Inst., Ibaraki). Proc. Jap. Nat. Congr. Appl. Mech., 13th, 1963, 225-9 (1963). (Publ. 1965).

The finned surface is used to increase the heat transfer in high-temperature applications, especially in heat exchangers, space-vehicle radiators, and fuel-elements of gas-cooled reactors, which require high flux heat transfer. A generalized solution of the temperature distribution and efficiency of the fin with an internal heat-generating source as in fuel elements of reactors is further examined by deriving a steady-state heat transfer equation and by applying it systematically to several specific cases, including the case of thick fins with an appreciable heat-transfer tip surface. A basic pattern of a fin of arbitrary cross section and the Gardner assumptions are used as a basis to derive the fundamental equation. A rigorous equation for the heat transfer from a convective fin with uniformly distributed internal heat generating sources was derived. The temperature distribution and efficiency of a single plate fin or annular fin, and the effect of fin thickness are analytically determined. When the fin height is larger than ten times the fin thickness, the heat transfer from the fin tip can be neglected and the heat transfer of the fin becomes one dimensional. (BBB)

45861 IMPROVEMENTS RELATING TO HEAT EXCHANGERS. Taylor, Anthony James; Hawkins, Ronald James (to Babcock and Wilcox Ltd.). British Patent 1,042,595. Sept. 14, 1966. Filed Nov. 27, 1962.

An improved heat exchanger having a casing formed with walls adapted to support a bank of tubes is described. The walls are fluid-tight and each is made of flanged plates having inner and outer edge flanges. The heating fluid flows in the spaces between the inner and outer flanges. The heat exchanger is contained in the annular space between the core of a power reactor and the pressure vessel. (F.S.)

Materials Testing

Refer also to abstract 47001.

45862 (SWRI-1228P1-28) STUDIES OF THE FATIGUE STRENGTH OF PRESSURE VESSELS. (1) CYCLIC PRESSURE TESTS OF LARGE SIZE PRESSURE VESSELS. (2) LOW CYCLE FATIGUE TESTING OF ONE-HALF SCALE MODEL PRESSURE VESSELS. (3) EFFECT OF WELD DEFECTS ON THE FATIGUE STRENGTH OF A302B STEEL. Progress Report No. 19. Pickett, A. G.; Grigory, S. C. (Southwest Research Inst., San Antonio, Tex.). Sept. 14, 1966. Contract AT(11-1)-1228. 76p. (SWRI-1228P2-28; SWRI-1228P5-28). Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Studies to develop information required to analyze or predict pressure vessel strength and service life are described. Variables investigated were the properties of materials, design details, fabrication methods, and inspection techniques. (R.C.K.)

45863 FUEL BURNUP MEASUREMENT IN THE ICE-BREAKER LENIN USING THE ACTIVITY OF ^{137}Cs WITHOUT CHEMICAL SEPARATION. Pravdyuk, N. F.; Vikhrov, V. I.; Pavlov, S. Yu.; Perevezentsev, V. N. At. Energ. (USSR), 21: 92-6(Aug. 1966). (In Russian).

A γ-scintillation spectrometer was used for measuring absolute values of fuel element burnup. The burnup was determined by the intensity of ^{137}Cs γ lines with $E_\gamma = 0.66$ Mev from ^{137}Cs accumulated in the fission products. The burnup of ^{235}U along the length of fuel elements in ice breaker Lenin was calculated. (R.V.J.)

45864 NON-DESTRUCTIVE TESTING OF THIN COATINGS. Williams, V. (Panax Equipment Ltd., Surrey, Eng.). Brit. J. Non-Destruct. Test., 8: 51-2(Sept. 1966).

For quicker and more accurate nondestructive testing of thin coatings, an instrument based on the principle of beta back-scattering was designed. Back-scattering pro-

duced by particles from a beta source are detected by a Geiger-Mueller tube or a scintillation counter. Using standards of known plating thickness, a calibration curve can be constructed of counts against plating thickness which is then used to measure samples of unknown thickness. This instrument offers a fast, low cost, accurate means of nondestructively testing thin coatings of the order of micro-inches to within an accuracy of a few percent. (F.S.)

45865 N.D.T. APPLIED TO PIPELINE CONSTRUCTION AND OPERATION IN THE USA. PART 2. Barkow, A. G. Brit. J. Non-Destruct. Test., 8: 53-72(Sept. 1966).

Nondestructive testing in pipeline construction and operation in the United States is discussed. Development and construction of suitable equipment, e.g., x-ray machines, gamma cameras, and film holders are also discussed. The detection of pipeline weld defects is described. (R.C.K.)

45866 RADIOGRAPHY OF IRRADIATED FUELS OF VERY HIGH ACTIVITY. Chassende-Baroz, Norbert (CEA, Paris); Hayet, Lucien. Ind. At., 10: No. 7-8, 87-91 (1966). (In French).

A film was developed for radiographs of extremely radioactive fuel elements. (P.C.S.)

45867 RADIATION INSPECTION CENTER AND EQUIPMENT IN MITSUBISHI ITAMI WORKS. Maeda, Yoshiro (Mitsubishi Electric Mfg. Co., Ltd., Japan). Mitsubishi Denki Giho, 40: 989-95(June 1966). (In Japanese).

A new radiation inspection center in the Itami Works is described which solves problems of safety in radiation inspection and operation of existing facilities, and also improves the utilization of nondestructive inspection. In building the new inspection room, careful consideration was given to the selection of the site, space, environment, and economic restrictions on the installation for radiation inspection from the viewpoints of protection against radioactivity and working efficiency. The design consideration, radiation inspection equipment, and accessory components in the center are described. The objective is to improve quality assurance of the products by nondestructive inspection techniques. (auth)

45868 PROCEEDINGS OF THE FIFTH ANNUAL SYMPOSIUM ON NONDESTRUCTIVE EVALUATION OF AEROSPACE AND WEAPONS SYSTEMS COMPONENTS AND MATERIALS, APRIL, 20, 21, 22, 1965, SAN ANTONIO, TEXAS. San Antonio, Society for Nondestructive Testing, Inc., 1966. 371p. $10.00. (CONF-650453).

Nondestructive testing techniques applicable to aerospace and weapons systems components and materials are discussed. Ultrasonic testing, radiographic inspection, infrared techniques, thermal imaging, and magnetic testing methods are described. (R.C.K.)

Space Propulsion

See also ISOTOPE TECHNOLOGY — Power Application
REACTOR TECHNOLOGY — Propulsion and Space

Refer also to abstract 46188.

45869 (NASA-TN-D-3656) HIGH-ENERGY ION BEAMS USED TO ACCELERATE HYDROGEN PROPELLANT ALONG MAGNETIC TUBE OR FLUX. Englert, Gerald W. (National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center). Oct. 1966. 50p. CFSTI $2.00 cy, $0.50 mn.

An analytical study was made of the transfer of energy from a high-intensity beam of light-weight ions to a hydrogen target. The hydrogen was confined to a region bounded by a magnetic tube of flux. Under certain conditions the gradient of the magnetic field was quite effective in accelerating sizable mass flows of hydrogen which resulted in large increases of momentum over that of the impinging beam. Interaction between the various species of particles was studied in detail. The analysis was applied to the efflux of ions from a hypothetical 100-Mw thermonuclear reactor. The stream of ions escaping from the weaker mirror of a magnetic mirror system was represented by a high-flux-density monoenergetic unidirectional beam. Hydrogen was admitted into this beam slightly downstream of the weak mirror exit station. Thus, the hydrogen served as the propellant and the reactor as the energy source of a thermonuclear rocket. A range of magnet sizes and strengths, energy and cross-sectional areas of the beam, and hydrogen flow rates were studied. Energy transfer was most effective when the beam was concentrated on a dense closely confined target. Ionization and acceleration of the hydrogen was usually quite rapid near the station where the beam first impinged on the target. Beyond a distance of about one magnet diameter downstream of this station, the velocity was increased and density decreased to values that permitted little further energy transfer. The fractional ionization then stayed essentially constant; however, acceleration continued for another two magnet diameters because of the continuing high gradient of the magnetic field that interacted with the remaining thermal energy in the propellant electrons. At low hydrogen flow rates only a small amount of energy could be transferred from the beam to the target. At high flow rates, loss was mainly due to power consumed in ionizing the hydrogen. The momentum (thrust) of the hydrogen could be increased to seven times that of the beam with an overall energy transfer efficiency of 25 percent. (auth)

45870 POWER SYSTEMS FOR AN UNMANNED LUNAR ROVING VEHICLE. Hsi, K.; Pellmann, R. R. (Bendix Systems Div., Ann Arbor, Mich.). Contract 950656. J. Spacecraft Rockets, 3: 1357-61(Sept. 1966).

Results are presented of a study of various power systems adaptable to a small (100 to 150 lb) unmanned lunar roving vehicle with an operating life of no less than three months. Two operating concepts are considered: (1) continuous operation during lunar day and night, and (2) intermittent operation during lunar day and nonoperation with minimum survival power during lunar night. Applicable power systems are compared on the basis of power requirements and the power profiles for both concepts. An optimum power system is selected for each operating concept, and the major problem areas are discussed. The power system selected for concept 1 is a radioisotope thermoelectric generator (RTG) system sized for peak power demand. The power system selected for concept 2 consists of solar cells to furnish average power during lunar day, a battery to furnish peak power, and an RTG to furnish survival power during lunar night. For a 100-lb vehicle, these two power systems would weigh approximately 39 and 30 lb, respectively. (auth)

45871 APPLICATION OF NUCLEAR ELECTRIC PROPULSION TO MANNED MARS MISSIONS. Brown, Harold; Coates, Gordon L. (General Electric Co., Philadelphia). J. Spacecraft Rockets, 3: 1402-8(Sept. 1966).

Some interim results of a continuing feasibility study of a manned Mars landing mission using a combination of nuclear rocket and nuclear electric propulsion are presented. These include an analytical tool for simultaneously optimizing the vehicle design and its associated trajectory, a typical resultant vehicle/trajectory concept, and preliminary parametric performance data. The results indicate that a straightforward vehicle design using standard Saturn V launch vehicles is reasonably feasible. The required initial mass in Earth orbit lies between 400,000 and 900,000 kg; depending on trip time, Earth return conditions, and powerplant specific weight. An electrical power of 3–8 Mw is required at a powerplant specific weight of 10–20 kg/kw. (auth)

45872 METHOD OF AND APPARATUS FOR ACCELERATING IONS. Bankston, Weldon S. Jr. (to Dept. of

Navy). U. S. Patent 3,258,645. June 28, 1966. Filed Mar. 16, 1964.

A device is described which provides a simple and effective method for accelerating ions or plasma jets. The device is useful in rocket propulsion systems, nuclear reactors, and in the investigation of blast effects. Ionic particles generated by an exploding wire are accelerated by a series of axially-spaced coils. Around the coils, an electromagnetic field is induced by the same current pulse which is applied to the wire. The coils are not directly connected, either physically or electrically, so that the electromagnetic fields act successively upon the particles. The collapsing fields add an accelerating force to the particles as they pass through the windings. (F.S.)

45873 DIRECT HEATING CONTACT IONIZATION PROPULSION SYSTEM. Davis, Jack W.; Gaffin, William O. (to United Aircraft Corp.). U. S. Patent 3,258,909. July 5, 1966. Filed May 11, 1962.

An ion propulsion system is described. The system consists of a nuclear reactor or other nuclear heat source, an ionizer, a source of propellant, means for pumping the propellant, a liquid metal loop to carry heat from the source to the heat exchanger, and a loop to carry heat from the heat exchanger to the ionizer. The ionizer operates by direct conductive heating or by radiant heat transfer. (F.S.)

Vacuum Engineering

45874 (NASA-TM-X-1268) HIGH-VACUUM TECHNOLOGY, TESTING, AND MEASUREMENT MEETING, [HELD AT] LEWIS RESEARCH CENTER, CLEVELAND, OHIO, JUNE 8–9, 1965. Compilation of Papers. (National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center). Aug. 1966. 219p. (CONF-650675). CFSTI $6.00 cy, $1.25 mn.

Included are 30 papers presented at the conference on testing and technology of space simulation facilities, ultrahigh vacuum technology and applications, vacuum measurements, and vacuum effects. (F.S.)

45875 INTERACTION OF OXYGEN WITH HOT TUNGSTEN. Singleton, J. H. (Westinghouse Electric Corp., Pittsburgh). J. Chem. Phys., 45: 2819-26(Oct. 15, 1966).

The reaction of oxygen at a polycrystalline tungsten surface was studied over a temperature range from 1300 to 2450°K and for oxygen pressures from $\sim 10^{-5}$ to $\sim 10^{-8}$ torr. A mass spectrometer was used to measure the oxygen pressure. In determining absolute pressures care was taken to avoid errors due to spurious currents in a Bayard–Alpert ion gauge. The efficiency of removal of carbon impurity from tungsten, by heating in oxygen, was determined. After obtaining a low carbon content, the rates of removal of oxygen at the tungsten surface were determined as a function of temperature. At temperatures below ~2000°K evaporation of oxides of tungsten occurs at predictable rates. At higher temperatures atomic oxygen is produced and the observed rate of removal of oxygen is strongly influenced by the specific surfaces present in the entire system. For example, a silver surface efficiently reacts with oxygen atoms, without apparent saturation, to give a large apparent increase in the pumping speed at a tungsten surface enclosed in a glass system. (auth)

45876 THEORETICAL ISOTHERMS FOR PHYSICAL ADSORPTION AT PRESSURES BELOW 10^{-10} TORR. Hobson, J. P. (National Research Council, Ottawa). J. Vac. Sci. Technol., 3: 281-4(1966).

Theoretical isotherms for the physical adsorption of argon, nitrogen, and helium on a heterogeneous surface in the pressure range from 10^{-10} torr down to pressures indefinitely low are presented. The calculations are based on adding a single assumption to a model that was successful in correlating experimental data for argon, nitrogen, and helium over a wide range of adsorbents, temperatures and pressures above 10^{-10} torr. The results are compared with an alternative model that postulates a homogeneous surface and are found to be significantly different. It is concluded that experiments should be possible to establish which, if either, of these approaches is useful. (auth)

45877 TRIGGERING OF A PENNING DISCHARGE IN ULTRAHIGH VACUUM BY USING ^{63}Ni. Hayashi, Chikara (Japan Vacuum Engineering Co. Ltd., Yokohama). J. Vac. Sci. Technol., 3: 286-7(1966).

The time delay in starting up a Penning discharge was measured at 6×10^{-10} torr, Nickel-63 was plated on a nickel ring, which in turn was fixed to the rear side of the cathode. Some of the secondary electrons produced at the inner surface of the envelope opposite the ^{63}Ni β-ray source pass through a hole in the cathode plate. The intensity of the β-ray source in the experimental apparatus was estimated to be between 13 and 60 μCi. With the cathode at a negative potential with respect to the envelope (secondary electron-emitting electrode), secondary electrons passing through the hole oscillate in the cathode-anode region before it reaches the anode, thus making easier the start up of the discharge. (F.S.)

45878 NEW GETTER-ION PUMP BASED ON THE PRINCIPLE OF THE ORBITRON. Sibley, C. B. (NRC, St-Julien, France); Plaziat, C. Vide, 21: 287-90(July-Aug. 1966). (In French).

Performance of the 4'' and 6'' ORB-ION nonmagnetic ion pump based on the principle of the Orbitron developed at the University of Wisconsin is given. The high pumping speed, lack of magnetic field, ease of outgassing and stable inert gas pumping capacity make the unit interesting for countless ultra-high vacuum applications. Pumping curves for a typical system are shown along with discussions of the mechanisms and technique of operation. (auth)

GEOLOGY, METEOROLOGY, AND MINERALOGY

General

45879 (SC-M-66-451) HUGONIOT EQUATION OF STATE OF MATERIALS FOR THE FERRIS WHEEL PROGRAM. Flanagan, T. J. (Sandia Corp., Albuquerque, N. Mex.). Sept. 1966. Contract AT(29-1)-789. 18p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A compilation of Hugoniot equation of state data for several geologic materials is presented. These materials include playa, alluvium, sand, limestone, dolomite, marble granite, and tuff. Additional data on several grouts designed to match the Hugoniot properties of these materials are also presented. (auth)

45880 (YALE-2912-12) TRACE ELEMENTS IN SEA WATER AND OTHER NATURAL WATERS. Annual Progress Report, December 1, 1965–November 30, 1966. Geochemistry Technical Report 13. Turekian, Karl K. (Yale Univ., New Haven, Conn. Dept. of Geology). Aug. 31, 1966. Contract AT(30-1)-2912. 60p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

A neutron activation technique for the analysis of stream waters for trace elements was developed. This involves the addition of a carrier salt, high purity sodium carbonate, freeze drying and irradiation of the recovered residue after which separation and counting of the desired radioactive nuclide is done. The method has been applied successfully to the determination of silver and cobalt and is potentially suitable for the determination of twenty elements from a single 100 ml aliquot. Connecticut streams were analyzed for chlorides, silicon, calcium, strontium, barium, silver, and cobalt. These analyses indicate that the strongly polluted and high metal content Naugatuck River does not change the metal content of the Housatonic River markedly, and the Connecticut River decreases in concentration of silver and cobalt as the mouth of the river is approached before the strong effect of seawater is felt. This is believed to be due to diffusive mixing of seawater up the Connecticut River injecting strontium and sulfate ions. The removal of silver and cobalt may then be due to the action of hydrogen sulfide production by sulfate reducing bacteria. A detailed analysis of the variation of trace element concentrations down the Neuse River (North Carolina), a relatively industrially unpolluted stream passing over several different geologic terrains, indicates that a single sample gives a fair representation of the composition of the whole stream. On the basis of these observations a systematic sampling and analysis program of the world's major streams for trace elements has been initiated to study the marine geochemistry of the trace elements as far as stream supply is concerned. A systematic study of the trace element chemistry of Long Island Sound is on its way towards completion. There is a good indication that silicon is extracted from open ocean water entering the Sound, probably biologically. The determination of the distribution of silver, cobalt, and nickel in Long Island Sound waters is close to completion. Samples have been collected in the west Atlantic sector of the Antarctic Ocean, where the Antarctic Bottom Water has its origin. Critical samples will be analyzed to compare the chemical properties of Atlantic sector Antarctic waters with Pacific sector Antarctic waters and also to evaluate the role of supply of material from Antarctic glaciation. (auth)

45881 GEOLOGY OF THE NORTHWESTERN PART OF HYOGO PREFECTURE. Matsubara, Hideki; Sakamoto, Toru (Geological Survey of Japan). Chishitsu Chosasho Geppo, 17: 65-74(Feb. 1966). (In Japanese).

Geological sequence of the Northwestern part of the Hyogo Prefecture was found to be as follows: recent–alluvium, pleistocene~pliocene–oginosen volcanics, pliocene~upper miocene–teragi group, middle~lower miocene–hokutan group, and cretaceous–granites. Radioactive anomaly was not detected in the surveyed area. (auth)

45882 ISOTOPIC STUDY OF GALENAS FROM THE UPPER MISSISSIPPI VALLEY, THE ILLINOIS-KENTUCKY, AND SOME APPALACHIAN VALLEY MINERAL DISTRICTS. Heyl, A. V.; Delevaux, M. H.; Zartman, R. E.; Brock, M. R. Econ. Geol., 61: 933-61(Aug. 1966).

Analyses of lead isotopes in galena in carbonate rock ore deposits collected from several mineralized districts in the Central and Eastern Interior of the United States support previous studies in establishing that the galena is anomalously radiogenic ("J-type"). Samples were tested for geologic relationships. These tests showed regionwide and districtwide systematic variations in isotope ratios. The genetic implications of these variations are discussed. Two mechanisms of origin are considered to explain these variations in isotopic ratios. One involves mixing of leads from multiple sources, the other calls for variable lead-isotope ratios originating from a single source. Several source materials for the lead ores have been suggested; whether a single source has predominated, or two or more main sources have predominated is still unresolved. Slopes from $^{206}Pb/^{204}Pb$ versus $^{207}Pb/^{204}Pb$ plot are compatible with a contribution of lead by the 1300 ± 300 milion yr basement rocks that underlie the deposits. The spatial relationships of alkaline igneous rocks to several of the mineral districts in the Mississippi Valley region suggest a possible magmatic source for the lead. Isotopic analyses of galenas closely associated with several of the intrusive rocks are similar in isotopic composition to adjacent ore leads, but genetic implications are ambiguous. Galena occurring in shales in the Mississippi Valley region outside mineralized districts contains ordinary lead. Theories that call upon such shales to be the major source of the lead in the deposits of the Mississippi Valley type must explain this distinct difference in isotopic compositions. Galena collected from districts within the Appalachian Ridge and Valley Province contains notably less radiogenic lead than that from the Mississippi Valley mineral districts, and the lead is of the ordinary type. (auth)

45883 DISCORDANCE OF MINERAL AGES IN GRANITIC ROCKS RESULTING FROM THE REDISTRIBUTION OF RUBIDIUM AND STRONTIUM. Arriens, P. A. (Australian National Univ., Canberra); Brooks, C.; Bofinger, V. M.; Compston, W. J. Geophys. Res., 71: 4981-94 (Oct. 15, 1966).

Examples of discordant Rb–Sr mineral ages in granite rocks from Australia illustrate a pattern of postcrystallization isotopic redistribution not previously recorded. Biotite retains the age of crystallization measured from total-rock samples, but K-feldspar gives a younger age and plagioclase an older age if the calculations are made using the total-rock initial $^{87}Sr/^{86}Sr$ ratio. Neither isotopic homogenization nor redistribution of Rb is considered probable under conditions which failed to affect the Rb–Sr and K–Ar ages of biotite in these rocks and a mechanism of expulsion of radiogenic ^{87}Sr from the K-feldspar is favored. The internal redistribution of Rb and Sr can be specified by four models of isotopic movement, and the pattern of response in any rock would depend on the intensity of the postcrystallization event. (auth)

Meteorology

See also Site Survey and Selection

45884 ^{133}Xe AS AN ATMOSPHERIC TRACER. Ludwick, J. D. (Battelle-Northwest, Richland, Wash.). J. Geophys. Res., 71: 4743-8(Oct. 15, 1966). (BNWL-SA-305).

A program was developed for emission, collection, and analysis of the radioactive rare gas ^{133}Xe as an atmospheric tracer. The value of this type of tracer lies in its inert characteristics and the ability to follow the diffusion processes without regard for many of the factors influencing other tracers. Field experimentation using this technique in collaboration with other more commonly used tracers allows correction factors to be developed for the less ideal tracers. (auth)

Natural Radioactivity and Fallout

See also HEALTH AND SAFETY

Refer also to abstract 46030.

45885 (AD–639446) A PREDICTION SYSTEM FOR THE NEUTRON-INDUCED ACTIVITY CONTRIBUTION TO FALLOUT EXPOSURE RATES. Jones, T. H. (Naval Radiological Defense Lab., San Francisco, Calif.). Aug. 12, 1966. 52p. (USNRDL-TR–1056). CFSTI $3.00 cy, $0.50 mn.

A system was devised to predict the neutron-induced activity contribution to fallout exposure rates. The system uses the simplifying assumptions of a semi-empirical formula to determine the soil capture fraction and thermal neutron cross sections to represent weapon-neutron cross sections. Results, using these assumptions, agree with those of another complete system for predicting the neutron-induced activity contribution to fallout exposure rates. In addition, results from various portions of the system agree with results obtained by more complicated methods. A computer program was written in Fortran for use in the calculations and is included. (C.H.)

45886 (NP–16262) NEKOTORYE DANNYE O ZAVISIMOSTI MEZHDU SODERZHANIEM STRONTSIYA-90 I TSEZIYA-137 V OKRUZHAYUSHCHEI SREDE I ORGANIZME LYUDEI. (Some Data Concerning the Relationship Between the ^{90}Sr and ^{137}Cs Contents in the Environment and in Man). Zykova, A. S.; Telushkina, E. L.; Yartsev, E. I.; Efremova, G. P.; Rublevskii, V. P. (Institut Atomnoi Energii, Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow). 1965. 15p. Dep. mn.

Observations of the relationship between the ^{90}Sr and ^{137}Cs concentrations in the environment and in man from 1958 to 1964 are reported. An analysis of the data shows that a direct relationship exists between the concentrations of ^{90}Sr and ^{137}Cs in the atmosphere and the density of fallout whenever the observation time is long enough (1 year) to make the influence of meteorological factors negligible. A direct relationship was also observed between the ^{90}Sr content in fallout and milk; the ratio of ^{90}Sr in milk in pC/l to fallout density in mC/km^2 being approximately 4/3). If there is no further testing of nuclear weapons, the density of ^{90}Sr fallout in 1966 should fall to the 1959 to 1961 level of 1.0 to 1.5 mC/km^2. Contamination in milk by ^{90}Sr during 1966 will be mainly due to the ^{90}Sr in soil and will be 1.5 to 2 times larger than in the 1959 to 1961 period. The ratio of ^{90}Sr content in children's bones to its content in milk (in pC/g Ca) is equal to 0.2 on the average for the 1959 to 1964 period. (JPRS)

45887 (NP–16290) RADIOACTIVITY SURVEY DATA IN JAPAN. Number 8. (National Inst. of Radiological Sciences, Chiba (Japan)). Aug. 1965. 20p. Dep. mn.

Cesium-137 and ^{90}Sr were determined in the total diet, dietary constituents (rice, wheat, vegetables, and powdered milk), rain water, and source waters from various locations in Japan. Fluctuations in dietary content of ^{90}Sr are correlated with the status of weapons testing between 1957 and 1964. (H.G.D.)

45888 (NYO–3654-1) PROJECT STREAK. Quarterly Progress Report No. 1. Seitz, Harold (Isotopes, Inc., Westwood, N. J.). Sept. 30, 1966. Contract AT(30-1)-3654. 11p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A four-season model of diffusion and rainout of stratospheric radioisotopes has been developed and tested. The criteria to be satisfied are the characteristics of the stratospheric distributions and wet and dry surface fallout distributions observed in the tungsten-185 data. The realization of a spring peak in the surface fallout is the additional objective of the seasonal model. Graphs showing distribution of surface deposition and deposit by rain of tungsten-185 are included. Plans for testing the model with strontium-90 and beryllium-7 are discussed. (H.L.W.)

45889 (PG-Report–587) THE BIOLOGY OF THE SOLWAY FIRTH IN RELATION TO THE MOVEMENT AND ACCUMULATION OF RADIOACTIVE MATERIALS. II. THE DISTRIBUTION OF SEDIMENTS AND BENTHOS. Perkins, E. J.; Williams, B. R. H. (Production Group, United Kingdom Atomic Energy Authority, Annon (Scotland)). 1966. 64p. Dep. BIS $2.00. HMSO 10s.

The distribution of sediments and benthos were studied in relationship to insoluble or particulate radionuclides. The mechanisms of transport of silt and associated radioactivity in the northeast Irish Sea and the Solway Firth are shown to be primarily due to the differential between flood and ebb tide velocities consequent upon distortion of the tidal wave. A possible reason for the fundamental difference between marshes bordering upon the Irish Sea and those of the east coast of England is discussed. (auth)

45890 (RLO–1750-8(Vol.2), (Paper 2)) RADIOACTIVITY OF SEDIMENTS IN THE COLUMBIA RIVER ESTUARY. Jennings, Charles David (Oregon State Univ., Corvallis. Dept. of Oceanography). 62p. Thesis.

Sediment radioactivity was measured in the Columbia River by use of an in situ gamma-ray detector, calibrated to give activity in pc/cm^2. The probe has several advantages over methods which couple collection of sediments with laboratory radioanalysis. Most important is the rapidity with which field measurements can be made. Sediments concentrate radioactivity and in the Columbia River the level of radiation is about an order of magnitude higher in the sediments than in the water above it. Benthic organisms which live in the sediments are constantly exposed to this higher radiation level. Chromium-51 and ^{65}Zn were the two man-made radionuclides present in greatest abundance in the Columbia River. The $^{51}Cr/^{65}Zn$ ratio in the sediments varied, but ^{51}Cr activity was about ten times as high as the ^{65}Zn activity. Also identified in the Columbia River sediments, but with lower activities were ^{40}K, ^{60}Co, and ^{54}Mn. (43 references.) (auth)

45891 (UCRL–14922) A GRAPHICAL METHOD FOR CALCULATING THE DOSE IN MAN FROM INDIVIDUAL RADIONUCLIDES IN FALLOUT. Burton, C. Ann (Lawrence Radiation Lab., Univ. of California, Livermore). June 3, 1966. Contract W-7405-eng-48. 20p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The fallout deposition required to deliver a specific integrated 30-yr dose to any tissue in man, for any and all radionuclides in a single event, is presented in graphical as well as analytical form. The model used is consistent with the data that are available to this problem at the present time. A table of effective tissue half-lives for given radiological and biological half-lives is given for use with the graphs. Sample calculations are also included. (auth)

45892 STUDY OF THE RADIOACTIVE CONTAMINATION OF CEREAL PRODUCTS. Michon, G.; Coulon, R. Ann. Fals. Expert. Chim., No. 666, 160-5(Mar.-May 1965). (In French).

The radioactive contamination in wheat flour from ^{137}Cs and ^{90}Sr was determined from 1960 to 1962. The measurement technique and sampling procedure are outlined. The wheat was from various provinces of France. The results obtained are tabulated. (J.S.R.)

45893 CONTAMINATION OF SOILS AND PLANTS WITH ^{90}Sr AS A RESULT OF NUCLEAR WEAPON TESTS IN THE INTERVAL FROM 1960 TO 1963. Fielder, H. J.; Reissig, H. (Technische Univ., Dresden). Biol. Rundschau., 3: 149-68(1965). (In German).

The ^{90}Sr contamination of soils and some important agricultural plants (grass, rye, potatoes, and cabbage) in the area of the DDR was established and compared with available international data. The increase of the ^{90}Sr content in soils of the DDR had a rigid relation with the ^{90}Sr total fallout. The variation in the ^{90}Sr content occurring between the individual cites can be traced back to the different precipitation levels. The comparison with international data shows good agreement. The ^{90}Sr contamination of plants in the area of the DDR shows also good agreement with the international estimates. It was relatively low in 1960 and 1961. As a result of the nuclear weapon tests in the spring of 1961, the ^{90}Sr contamination of the plants increased in 1962. A sharper increase was noted in 1963. The evolution tendencies in the plants or plant parts with higher sensitivity for a ^{90}Sr surface contamination (grass and grains) agrees well with the ^{90}Sr fallout rate. The ^{90}Sr content of the plants insensitive or only slightly sensitive to ^{90}Sr surface contamination such as potatoes and cabbage were more strongly affected. Accumulative ^{90}Sr content of the soil showed in 1962 and 1963 a slighter increase than the grasses or the grains. (tr-auth)

45894 RADIOMETRIC SURVEY WITH A CAR-MOUNTED INSTRUMENT IN THE WESTERN PART OF IWATE PREFECTURE. Obi, Nakamaru (Geological Survey of Japan). Chishitsu Chosasho Geppo, 17: 87-90 (Feb. 1966). (In Japanese).

A reconnaissance radiometric survey was made in the Western part of Iwate prefecture, using a Mount Sopris's Model SC-156A scintillation counter equipped with a detector coupled to a photomultiplier with a sodium iodide phosphor 5 in. in dia and 2 in. thick. The granitic rocks distributed in the Kitakami highland, in the eastern part of the area, are as weakly radioactive as the sedimentary rocks, mostly of Permian age, in the eastern part and of Neogene age in the western part, while the radioactivity of the granitic rocks in the western part is the highest in this area. A radioactive anomaly was discovered on the exposure of the Permian formation composed of chert and schalstein, at Ōshida, Morioka City. (auth)

45895 RADIOMETRIC SURVEY WITH A CAR-MOUNTED INSTRUMENT IN THE NORTHERN PART OF TOCHIGI PREFECTURE. Obi, Nakamaru (Geological Survey of Japan). Chishitsu Chosasho Geppo, 17: 91-4 (Feb. 1966). (In Japanese).

In order to obtain the distribution of natural radioactivity, a radiometric survey with a car-mounted scintillation counter was made in the Northern part of Tochigi prefecture, in October 1962. The area surveyed was approximately 1,600 sq. km. The detector of the scintillation counter consisted of a NaI(Tl) phosphor of 5 in. in dia and 2 in. thick, with a 6364 photomultiplier. Distribution of the radioactivity of the rocks in this area was as follows: Quaternary volcanic rocks 500-300 counts/sec, Tertiary sediments 700-500 counts/sec, Tertiary volcanic rocks 700-500 counts/sec, Granitic rocks 900-700 counts/sec, and Paleozoic sediments 700-500 counts/sec. At the two localities of granitic rocks, a gamma ray intensity above 1,000 counts/sec was recorded. However, no radioactive anomalies due to uraniferous deposits were observed. (auth)

45896 RADIOMETRIC SURVEY WITH A CAR-MOUNTED INSTRUMENT IN THE MATSUMOTO DISTRICT OF NAGANO PREFECTURE. Sugiyama, Tomonori; Nakai, Junji (Geological Survey of Japan). Chishitsu Chosasho Geppo, 17: 95-7(Feb. 1966). (In Japanese).

A radiometric survey with a car-mounted scintillation counter was made in the Matsumoto district of Nagano prefecture from November to December in 1963. As a result, the radioactive intensity of rocks was obtained. The radioactive anomaly was recognized in the Southern part of Wadatoge and the Southeastern part of Oomachi. (auth)

45897 RADIOMETRIC SURVEY WITH A CAR-MOUNTED INSTRUMENT IN THE CENTRAL PART OF MIE PREFECTURE. Horikawa, Yoshio; Nakai, Junji (Geological Survey of Japan). Chishitsu Chosasho Geppo, 17: 98-103(Feb. 1966). (In Japanese).

In order to obtain the distribution of natural radioactivity in the central part of Mié prefecture, a radiometric survey by a car-mounted scintillation counter was made in March, 1962. The area surveyed was approximately 3,000 sq. km. The instrument is an Aloca CR-104 type counter with a detector whose scintillator is a NaI(Tl) crystal of 5 in. in dia and 2 in. thick. The response to an environment of normal radioactivity is from 450 to 500 counts/sec. This district consists mainly of granitic rocks, Neogene Tertiary sediments, and Tertiary volcanic rocks. No remarkably radioactive anomalies were found. The granitic rocks were less radioactive, ranging from 450 to 750 counts/sec, however high activities of 800 to 1,000 counts/sec were observed over the granitic rocks at the Southern part of Shiga prefecture. (auth)

45898 ISOTOPIC ABUNDANCE OF NEON FROM HELIUM-BEARING NATURAL GASES. Emerson, David E.; Stroud, Lowell; Meyer, Thomas O. (Bureau of Mines, Amarillo, Tex.). Geochim. Cosmochim. Acta, 30: 847-54(Sept. 1966).

The abundance of the neon isotopes from seven natural gas sources was determined. In order to obtain the necessary analytical data, neon was concentrated by a factor of approximately 2×10^6 and analyzed by means of a mass spectrometer. As a check on the possibility of the neon isotopic abundance being altered by the concentration technique, which involved separation of the neon by solidification at 4.2°K, a mixture containing 106 ppM of neon (atmospheric source) in helium was prepared and subjected to the analytical procedures for isotopic abundance determinations; there was no evidence of "isotopic shift." A total of 93 isotopic assays of neon was made from five Bureau of Mines and two private sources of helium-bearing natural gases. The results indicated that the amounts of ^{21}Ne from the helium-bearing natural-gas sources were significantly higher than those from atmospheric neon, and varied according to the source. Values compared to atmospheric neon for ^{21}Ne were higher by 45 to 500%. Wetherill suggested that nuclear reactions such as $^{18}O(\alpha,n)^{21}Ne$ could explain the origin of the excess ^{21}Ne. (auth)

45899 ISOTOPIC EXCHANGE IN THE HYDROBIOLOGICAL SYSTEM AND ITS SIGNIFICANCE. Barinov, G. V. (Inst. of the Biology of Southern Seas, Sevastopol). Hydrobiol. Zh., 1: 27-34(1965). (In Russian).

The isotopic exchange of ^{45}Ca and ^{89}Sr between macrophytic algae and sea water was studied. It was found that the kinetics of isotopic exchange is determined both by the chemical properties and biological role of the element and by the biological peculiarities of the organism. The kinetics of isotopic exchange is described by logarithmic, power, and power-logarithmic functions, corresponding to the basic equations of the statistical theory of complicated isotopic exchange. On the basis of the kinetic regularities of isotopic exchange, a method is proposed for computing the coefficient of accumulation and elimination of radioactive isotopes by macrophytes. The regularities found also make it possible to compute the rate of exchange of an element between the hydrobion and the environment, to assaying quantitatively the role of exchange processes in the biogeochemical rotation and, finally, to compute the biomass of plankton. (auth)

45900 TRANSPORT OF RADIOACTIVITY IN RAIN AND AIR ACROSS THE TRADE WIND INVERSION AT HAWAII. Kruger, Paul (Stanford Univ., Calif.); Miller, Albert. Contract AT(04-3)-457. J. Geophys. Res., 71: 4243-55(Sept. 15, 1966).

Radiochemical analyses of aerosols and precipitation collected along the slopes of Mauna Loa volcano in Hawaii show that the concentration of radioactivity in aerosols generally increases with height across the trade wind inversion. The time variations of the vertical distribution of radioactivity concentration and moisture mixing ratio were inversely correlated; intrusions of dry air having higher concentrations of radioactivity accompanied verti-

cal oscillations in the upper boundary of the moist surface layer. The concentration of ^{90}Sr in rain along the slopes generally decreased with altitude above the cloud base. This decrease is attributed to the continuous depletion of condensation nuclei through rainout while remaining droplets in the air parcels continue to grow as they move upslope. (auth)

45901 RADIOCHEMICAL STUDY OF TWO EXTRATROPICAL CYCLONES CONTAINING NUCLEAR DEBRIS OF DIFFERENT AGES. Kruger, Paul (Stanford Univ., Calif.); Hosler, Charles L.; Davis, Larry G. Contract AT(04-3)-457. J. Geophys. Res., 71: 4257-66(Sept. 15, 1966).

The radiostrontium ratios in precipitation from two extratropical cyclones in central Pennsylvania indicated the involvement of air masses containing nuclear debris of different sources and ages. The storm of November 10, 1962, which occurred during the period of atmospheric testing of nuclear weapons in the Soviet Union, included air masses containing at least two sources of nuclear debris, one from the spring 1962 tests and the other from the Fall 1962 tests. The storm of March 4, 1963, which occurred more than 2 months after the last detonations in the atmosphere, showed two layers in the atmosphere with debris of different average ages. In both cases, the $^{89}Sr/^{90}Sr$ ratio and concentration data showed variations related to changes in the height of the precipitation-generating level and the rates of growth and evaporation as deduced from time-height-intensity radar observations. (auth)

45902 MEASUREMENTS OF ^{220}Rn (THORON) IN THE ATMOSPHERE BELOW 50 CENTIMETERS. Crozier, W. D.; Biles, Norman (New Mexico Inst. of Mining and Technology, Socorro). J. Geophys. Res., 71: 4735-41 (Oct. 15, 1966).

Direct measurements of ^{220}Rn (thoron) was made from the ground surface to a height of 50 cm, using apparatus adapted from that of G. W. Israël. Activity profiles are similar to those calculated by Jacobi and André and by Wormell; this supports their assumption that in the 50-cm height range a linear increase of diffusivity with height properly describes the turbulent diffusion of radioactive emanations from the soil surface, at least for turbulence of moderate intensity. The maximum activity at ground level, as expected, occurs at night during intervals of very low wind speed; it reaches values 75 to 150 times as high as the typical activities at 50 cm and 1 m. The ^{220}Rn flux through the soil surface at our site is approximately 2.1×10^{-15} curie cm^{-2} sec^{-1}, or 0.006 atom cm^{-2} sec^{-1}. The activities of ^{220}Rn plus ^{216}Po observed under conditions of very low turbulent diffusion are capable of yielding an ion production rate of about 250 ion pairs cm^{-3} sec^{-1} in the lowest 10 cm of the atmosphere over appreciable time intervals; this seems adequate to explain the presence of the shallow stratum of relatively high space charge density previously reported to exist under these conditions. (auth)

45903 STUDIES ON FALLOUT PARTICLES. VII. Mamuro, Tetsuo; Matsunami, Tadao (Radiation Center of Osaka Prefecture). Nippon Genshiryoku Gakkaishi, 8: 416-23(1966). (In Japanese).

Three kinds of highly radioactive fallout particles—originating respectively from a Soviet large scale air burst occurring in autumn 1962, the first Chinese explosion (small scale land surface burst) and the second Chinese explosion (small scale air burst)—were measured by α-ray spectrometry for activity due to ^{239}Pu and ^{240}Pu, and by γ-ray spectrometry for ^{144}Ce and $^{95}Zr + {}^{95}Nb$ activity. Differences found in the specific activity of these nuclides and in their composition ratio among the three kinds of particles are discussed in connection with the conditions of the explosions from which they originated. The ratio of α-activity to total activity ($\alpha/(\alpha + \beta)$) was found to be considerably smaller in the collected particles than in the rain waters sampled in the periods immediately preceding and following the collection of the particles. The mean Pu concentration in the rain water samples collected in the period from 1962 to 1965 was found to be about 1×10^{-3} dps/l. (auth)

45904 MASS-YIELD DISTRIBUTION OF THE FISSION PRODUCTS IN FALLOUT FROM THE 14 MAY 1965 NUCLEAR EXPLOSION. Rao, M. N.; Yoshikawa, Kazuko; Sabu, D. D.; Clark, R.; Kuroda, P. K. (Univ. of Arkansas, Fayetteville). Science, 153: 633-5(Aug. 5, 1966).

Twenty single particles separated from a 20-liter sample of rain collected in Osaka Japan, shortly after the May 14, 1965 test explosion of the Chinese nuclear device, were analyzed radiochemically. The abundance pattern of the fission products in these particles resembled the shape of the mass-yield curve for the thermal neutron-induced fission of uranium-235, except for the facts that cesium-137 and strontium-90 were markedly depleted and the yields near the symmetric fission region appeared to be somewhat enhanced. (auth)

45905 DETERMINATION OF TURBULENT DIFFUSION DISTRIBUTION ALONG THE VERTICAL CONCENTRATION OF RADON DECAY PRODUCTS IN THE ATMOSPHERE. Styro, B. I.; Verba, E. Yu.; Shopauskas, K. K.; Khundzhua, T. G. (Inst. of Geophysics, Academy of Sciences, Georgian SSR). Soobshch. Akad. Nauk Gruz. SSR, 43: 327-34(Aug. 1966). (In Russian).

An attempt was made to determine the vertical component of the diffusion coefficient K_z using the data on the reactivity profile (radon decay products) in a free atmosphere obtained by air filtration through fibers with nuclear emulsion A-2 as a transducer, theoretical curves were constructed for the relative α-track concentrations in emulsion as functions of the elevation at various turbulent diffusion coefficient values. Airplane probing in free atmosphere coincided with one theoretical curve and permitted determination of $K_z = 5$ m^2/sec. Diffusion-decay equations for the radon product chain were written for the cases in which stationary conditions could be assumed. The theory of the experiment is discussed. (R.V.J.)

45906 ^{137}Cs AND ^{90}Sr FALLOUT IN JAPAN. PART I. Katsuragi, Yukio (Meteorological Research Inst., Tokyo). Tenki, 12: 323-8(Oct. 1965). (In Japanese).

Results are reported from measurements of ^{137}Cs and ^{90}Sr in rainwater collected monthly during 1964 at eight points in Japan made after radiochemical separation. Analysis of fallout showed that the nuclear weapon tests in 1961 and 1962 were different from those in 1945 to 1958 in two points. The ratio of the fission yield to the total yield was decreased due to the increased number of hydrogen bomb tests and the percentage of fission products blown up into the stratosphere was increased. It appears that since July 1959 ^{137}Cs and ^{90}Sr have mainly fallen from the stratosphere. The cumulative amounts of ^{90}Sr at the end of 1964 in Tokyo, Sapporo, Sendai, Akita, Osaka, and Fukuoka were 63, 77, 70, 123, 45, and 75/km^2, respectively. The ratio of ^{137}Cs to ^{90}Sr at these points ranged from 1.0 to 6.3. The average ratio of the cumulative ^{137}Cs to ^{90}Sr is 2.7, which is about 1.5 times larger than those in the United States, England, and Canada. The cause for this difference was studied. (auth)

45907 EFFECTS OF SOAKING ON ADSORPTION AND DESORPTION OF ^{90}Sr BY SOIL. Mel'nikova, M. K.; Prokhorov, V. M. (Scientific-Research Inst. of Agronomy Physics, USSR). Zh. Prikl. Khim., 39: 1693-6(Aug. 1966). (In Russian).

Experiments were conducted using slightly argillaceous black soil and turf-podzolized light argillaceous soil samples soaked with water and with 1% OP-7 (polyethyleneglycol octylphenol with 7 ethyleneglycol groups). The presence of OP-7 improved ^{90}Sr desorption from soil eluted with $Ca(NO_3)_2$ and trilon B and increased the coefficient of ^{90}Sr distribution in soaked soils. (R.V.J.)

45908 ENVIRONMENTAL RADIOACTIVITY IN ICELAND. Thoedorsson, Pall; Arnason, Bragi (Univ. of Iceland, Reykjavik). 15p. (CONF-747-10). ORAU.

From 4th Symposium on Radioactivity in Scandinavia, Riso, Denmark, Oct. 1964.

Measurements of radioactive fallout in Iceland from 1958 to 1964 are reported. Total beta activity was determined in

the atmosphere and in precipitation at Reykjavik; ^{137}Cs and ^{90}Sr in precipitation, milk, sheep, and reindeer; ^{90}Sr in soils; and ^{137}Cs in man. The ^{137}Cs content in Icelandic persons was approximately six times higher in 1962 than the mean value for German and Danish people. (H.G.D.)

45909 RECENT BRITISH STUDIES OF FALLOUT RADIOACTIVITY IN THE ENVIRONMENT, IN DIET, AND IN HUMAN BONE. Marley, W. G. (United Kingdom Atomic Energy Authority, London). 17p. (CONF-631111-4). ORAU.

From International Symposium on Radioactive Contamination of the Human Environment, Hiroshima.

Data are presented on the radioactivity due to fallout in the environment in Great Britain during 1962. Data are included on the content of ^{137}Cs and ^{90}Sr in samples of ground air, rain water, and milk, the content of ^{131}I in milk, and the content of ^{90}Sr in bone samples. (C.H.)

45910 MOLECULAR DIFFUSION OF RADIOISOTOPES IN INTERSTITIAL WATER OF SEDIMENTS. Duursma, E. K. (IAEA, Monaco). Vienna, International Atomic Energy Agency, 1966, Preprint SM-72/20, 24p. (CONF-660507-12). ORAU.

From Symposium for the Disposal of Radioactive Wastes into Sea, Oceans, and Surface Waters, Vienna.

The extent of radioisotope migration in sediments of the oceans is considered. The simplest way is to regard migration as a diffusion process defined by the basic diffusion law: $\delta C/\delta t = D(\delta^2 C/\delta x^2)$. The coefficient of diffusion D may differ from sediment to sediment or it may depend greatly on the chemical properties of the radioisotope. Knowing D, relations can be calculated for the concentration course in the sediment with depth and time. One case of boundary conditions is considered. Close-packed sediments may theoretically have the same water quantity between 20 and 25% (v/v). In addition the way of transport will not differ greatly, with the result that D can only depend on the wall influence of the sediment particles. The effect of the capillarity on the water itself is an indirect influence and in fine sediments the interstitial water molecules (and groups of them) have less freedom; the chemical reaction (sorption) with the sediment particles is a direct influence. D was found for nonreacting ions in sands to be 10^{-6}–10^{-5} cm^2/sec and for fine clays, with reacting ions, a value lower than 10^{-7} cm^2/sec. With the help of laboratory experiments it was possible to determine the diffusion coefficients for nonreacting ions in different sediments and separately the chemical activity for reacting isotopes. In this way two diffusion coefficients can be given: one depending on the sediment, the other on the sediment and the isotopes. To some extent it is possible to predict for certain isotopes the process of migration in sediments from which only the sedimental composition is known. (auth)

Site Survey and Selection

Refer also to abstract 47090.

Techniques and Equipment

45911 (AD-628148) GEOMETRY AND PATTERNS OF LARGE APERTURE SEISMIC ARRAYS. Lacoss, R. T. (Lincoln Lab., Massachusetts Inst. of Tech., Lexington). Dec. 31, 1965. Contract AF19(628)-5167. 86p. (ESD-TDR-65-596; TN-1965-64). CFSTI $8.60 cy, $0.75 mn.

A study of possible configurations for a Large Aperture Seismic Array (LASA) has been completed. An array having 21 identical subarrays located on three concentric circles has been found to yield the most satisfactory pattern in wave number space of all the configurations tested. Patterns for some alternative placements of subarrays, including that of the experimental LASA in Montana, are described. This study of patterns in wave number space has yielded the suggestion that a LASA having a diameter of 200 km should be composed of subarrays from 10 to 15 km in diameter. Such an increase of subarray size above the 7 km diameter subarrays of the experimental LASA would require the use of less regular subarray geometries than those which have been used in Montana. A sensitivity function for patterns has been developed. This function can be used to predict the change in patterns which might result from changes in seismometer or subarray positions. Since the sensitivity function predicts possible changes in patterns, it can be used to set bounds upon changes in an array which can be made without severely changing the pattern. The tight bounds imposed by the sensitivity function can be relaxed if the pattern resulting from any anticipated change in position is actually computed. Since very little computer time is required to compute a pattern, this procedure is highly recommended. (auth)

45912 (AD-628385) BASIC RESEARCH IN CRUSTAL STUDIES. Final Report, September 1, 1963–December 31, 1965. Backus, Milo M.; Laster, Stanley J. (Texas Instruments Inc., Dallas. Science Services Div.). Contract AF49(638)-1244. 396p. CFSTI $39.20 cy, $1.75 mn.

The studies were divided into four tasks: (1) single-layer models; (2) multilayer models; (3) models with layer thickness variation; and (4) experimental studies using field data. The single-layer studies included theoretical investigation of normal and leaking modes, studies of the practical aspects of frequency-wavenumber analysis and investigation of mode separation by multichannel filtering. Theoretical and analog model investigations for two layers over a half-space showed the difficulty in directly observing an intermediate velocity layer using frequencies of 0.5 cps or less. Analog model investigations of a model having a dipping M-discontinuity showed a wide range of phase velocities for ray events, as predicted. Experimental studies of field data showed the usefulness of velocity filtering as an interpretive aid. Correlation statistics for small events showed that only about 50% of the energy arriving between the first arrival and surface waves is predictable. For events at small distance ($\delta < 30$ km), Rayleigh-mode dispersion curves were measured. These suggested low near-surface velocities extending to a depth of 1/2-km. It was found that receiving arrays inline with the shot are necessary for adequate dispersion measurements. (auth)

45913 (BNL-10545) MEASUREMENT OF CHARGE TRAPPING CENTERS IN GEOLOGICAL SPECIMENS. Townsend, P. D. (Picatinny Arsenal, Dover, N. J.). Aug. 11, 1966. Contract AT(30-2)-Gen-16. 17p. (CONF-660919-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Conference on Applications of Thermoluminescence to Geological Problems, Spoleto, Italy.

The use of crystal defects, in particular the determination of occupancy of charge trapping centers, to study thermal history or to make age determinations is discussed in terms of the physical problems involved in making the measurements. The problems of defect production, annealing, and detection are outlined with emphasis on the role of charge transfer and distribution of charge between competitive defects. Examples of calculations of defect production are made to illustrate cases when there is simultaneous annealing and retrapping effects by the thermally unstable defects. The discussion leads to criteria which determine what defects are suitable for use as tools for dating. These criteria are used to examine examples of thermoluminescence data. (auth)

45914 (BNL-10561) THE EFFECTS OF ULTRAVIOLET LIGHT ILLUMINATION ON THE THERMOLUMINESCENCE OF CALCITE. Vaz, J. E. (Kansas Univ., Lawrence. Dept. of Geology); Kemmey, P. J. (Picatinny Arsenal, Dover, N. J.); Levy, P. W. (Brookhaven National Lab., Upton, N. Y.). [1965]. Contract AT-30-2-GEN-16. 27p. (CONF-660919-2). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From Conference on Applications of Thermoluminescence to Geological Problems, Spoleto, Italy.

Measurements of thermoluminescence spectra were made

on samples of uv irradiated Joplin calcite. The purpose was to determine the mechanism of charge redistribution between the defect centers responsible for the observed thermoluminescence. Illumination with ultraviolet light is shown to produce changes in the intensity of all glow peaks. Glow peaks which are thermally removed before illumination show increases in intensity upon illumination while peaks which are present before illumination are reduced in intensity. The rate at which changes are produced in the glow peaks depends on the temperature of the sample and wavelength of the light. Wavelengths in the region of 2900 and 2500 Å are particularly effective in producing changes in peak intensities. The effects of illumination are more pronounced in gamma irradiated samples than in natural samples. The above effects may be accounted for in terms of a defect model which assumes the presence of three sets of charge traps and a recombination center in addition to the luminescent center. (auth)

45915 (CALT-427-14) PROGRESS REPORT [ON DATING GEOLOGICAL EVENTS]. (California Inst. of Tech., Pasadena. Div. of Geological Sciences). Sept. 20, 1966. Contract AT(04-3)-427. 24p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Geological research at the California Institute of Technology is reviewed. The use of the $^{16}O/^{18}O$ ratio for the investigation of the history of air masses and the origin of tektites is discussed. The collection and analysis of snow samples for lead content in Antarctica is described. Investigations of the geochemistry of U, Th, and Pb were carried out to determine the distribution and mobilization of these elements among minerals and rocks in the earth's crust. (R.C.K.)

45916 (MIT-1381-12) VARIATIONS IN ISOTOPIC ABUNDANCES OF STRONTIUM, CALCIUM, AND ARGON AND RELATED TOPICS. Annual Progress Report No. 12, 1964. (Massachusetts Inst. of Tech., Cambridge. Dept. of Geology and Geophysics). Dec. 1, 1964. Contract AT(30-1)-1381. 254p. Dep. mn. CFSTI $6.00 cy, $1.25 mn.

The results of age estimations and analyses of isotopic abundances in New England, Canadian and Rhodesian rocks, Michigan shale, Hawaiian volcanic rocks, stony meteorites, and Ivory Coast tektites are presented. Also reported are studies on the geochemistry of strontium in sea and fresh water. (F.S.)

45917 IMPLICATIONS OF CARBON ISOTOPIC COMPOSITION OF TOTAL ORGANIC CARBON OF SOME RECENT SEDIMENTS AND ANCIENT OILS. **Eckelmann, Walter R.; Broecker, Wallace S.; Whitlock, David W.; Allsup, Jerry R. (Esso Production Research Co., Tulsa, Okla.). Bull. Amer. Ass. Petrol. Geol., 46: 699-704 (1962).**

Data on the carbon isotopic ($^{13}C/^{12}C$) composition of organic carbon from marine and freshwater sediments from a variety of localities are presented. The relations of these data to the source of the carbon in crude oils are discussed. The mass spectrometric analyses are reported as per mil deviations (δ) from the $^{13}C/^{12}C$ ratio of the Cretaceous belemnite, Belemnitella americana, from the Peedee Formation of South Carolina. Southeastern Pacific cores taken 150 miles off the northwestern coast of South America in a water depth of 2800 miles gave a value of –22.3% for the total organic matter of the sediment (701 cm depth). The age of this sample is ~150,000 yr. For a South Atlantic core taken 50 miles from the African shoreline near Walvis Bay results fell within the range of –20.2 to –21.0. Radiocarbon analyses on the 0–80 cm and 240–300 cm levels in this core yielded results of 3380 and 4130 yr respectively. Equatorial Atlantic cores from the flanks of the Mid-Atlantic Ridge consisted of typical globergerina ooze containing less than 1% organic matter in the acid-insoluble fraction. Because of the absence of any reasonable source of land or freshwater organic matter, the $^{13}C/^{12}C$ ratio of –19.3 per mil must reflect only marine plant and animal remains (~80,000 yr in age). Isotopic composition of organic carbon of shales associated with oils is also considered. The $^{13}C/^{12}C$ distribution of 128 crude oils Devonian and younger in age is shown. Most oils fall in the –26 to –30 per mil range, far removed from the more positive values recorded for organic matter distinctly derived from marine waters and within the range for freshwater and terrestrial organics. The most obvious explanation is that most oils are derived from organic materials formed in the atmosphere or in fresh (or brackish) waters. Ways in which plants and animals living in oceanic waters in the past could have yielded organic material 4 to 8 per mil lighter than that being produced today are discussed. (BBB)

45918 THE "LITTLE VARIABLE FACTOR." A STATISTICAL DISCUSSION OF THE READING OF SEISMOGRAMS. Freedman, Helen W. (Univ. of California, Berkeley). Bull. Seismol, Soc. Amer., 56: 593-604 (Apr. 1966).

In a recent discussion of the interpretation of seismograms from thermonuclear explosions, the term "little variable factor" was used with reference to individual observer differences in reading the data. Quantities such as arrival time are random variables whose distribution is influenced by the techniques used to obtain them. Both the observer and the instrument affect this distribution. The fact that instrumental precision has exceeded the training of the readers routinely making the observations is demonstrated. This study deals only with the arrival times of P waves, but similar analyses could be carried out for other information recovered from seismographic records, such as magnitude, amplitude, and period. In general, the data obtained may be less reliable than the precision of the instruments alone would suggest. The following questions are examined. (1) To what extent do readers agree on what they call the first-arriving phase from an earthquake? (2) What is the distribution of errors in reading the time of onset of a given disturbance? (3) To what extent do readers agree on what is an "impulsive" onset? These questions arose from studies on the construction of travel time tables. On the basis of the results a method is suggested for improving the accuracy of routine reading of seismograms. This model provides estimates for reading errors of several types of onsets. The classification of onsets into "i" and "e" is shown to be inadequately defined. (BBB)

45919 A STATISTICAL DISCUSSION OF Pn RESIDUALS FROM EXPLOSIONS. **Freedman, Helen W. (Univ. of California, Berkeley). Bull. Seismol. Soc. Amer., 56: 677-95 (June 1966).**

The problem of the statistical treatment of large numbers of Pn residuals (observed arrival times minus Jeffreys-Bullen theoretical travel times, corrected for ellipticity and station elevation) is considered, using travel times to stations in California and Nevada from 43 underground thermonuclear explosions in Nevada. Techniques of data selection and weighting of observations are developed to estimate the distribution of residuals and to estimate station adjustments to Jeffreys-Bullen travel times. A new simple method of estimating the mean of a normal population from a truncated sample is given. An approximate analysis of variance showed a significant variation from one explosion to another in the mean Pn travel time. On the average, large magnitude explosions, detonated in metamorphic rock, produced shortest and most reliable travel times. The station adjustments also differed significantly ranging from –0.0 sec at Fresno to –1.3 sec at Calistoga (California); confidence intervals about the station adjustments had half lengths of the order of half a sec. The results have implications for seismic studies which depend upon estimates of such station adjustments. In general, the trend seemed to be that stations toward the west were earlier with respect to the Jeffreys-Bullen tables than those further east, though still west of the Sierra Nevada. The marked delay at Fresno can be explained by the presence of thick tertiary sediment of the San Joaquin valley. (BBB)

45920 SULFUR ISOTOPE ABUNDANCE DATA, BINGHAM DISTRICT, UTAH. **Field, Cyrus W. (Oregon**

State Univ., Corvallis). Econ. Geol., 61: 850-70(Aug. 1966).

The $^{32}S/^{34}S$ ratios of 44 sulfide concentrates from the Bingham district range from 22.151 to 22.306 for a total isotopic variation of 7.0 per mill. This relatively small isotopic variation is consistent with the presumed hydrothermal origin of the sulfides in this porphyry-type environment. Because the mean $^{32}S/^{34}S$ ratio for all Bingham sulfides (22.228) is remarkably similar to that of meteoritic sulfur (22.220), the hydrothermal fluids may have been derived from a deep-seated source within the mantle. Different sulfide minerals of a sample exhibit small but near-consistent isotopic dissimilarities that conform to the trend of progressive ^{34}S depletion given by increasing mean $^{32}S/^{34}S$ ratios for molybdenite (22.191), pyrite (22.209), chalcopyrite (22.243), and bornite (22.260) of the central zone. The entire range of isotopic variation occurs within pyrite and is attributed to the widespread regional and geologic distribution of pyrite throughout the district. The isotopic composition of a sulfide may be partly controlled by its physical occurrence because mean $^{32}S/^{34}S$ ratios indicate that vein pyrite (22.209) is enriched in ^{34}S relative to disseminated pyrite (22.237) and a similar trend may exist for chalcopyrite. A weak isotopic zonation is evident for the Bingham district as mean $^{32}S/^{34}S$ ratios for pyrite indicate a progressive ^{34}S depletion outward from the central zone (22.209) through inner halo zone (22.225) to outer halo zone (22.246). Statistical analyses of the pyrite data show that the trend is three-dimensional. Because this weak district-wide isotopic zonation may be obscured by other complicating factors, it was concluded that sulfur isotope surveys are impractical as a routine exploration method. (auth)

45921 SULFUR ISOTOPES IN PYRITE, PYRRHOTITE, ALUNITE AND ANHYDRITE FROM STEAM WELLS IN THE TAUPO VOLCANIC ZONE, NEW ZEALAND. Steiner, A.; Rafter, T. A. (New Zealand Geological Survey, Lower Hutt, Inst. of Nuclear Sciences, Lower Hutt, N. Zeal.). Econ. Geol., 61: 1115-29(Sept.-Oct. 1966).

Sulphur-34 values for sixteen hypogene pyrites, six pyrrhotites and one anhydrite, as well as eight supergene alunite minerals are given and compared with earlier published $\delta^{34}S$ values for H_2S and the SO_4^{2-} ions present in the geothermal fluid that formed the iron sulfide minerals and anhydrite. Hypogene pyrite and coexisting anhydrite seem to reflect the isotopic composition of H_2S and the SO_4^{2-} ion in the geothermal fluid. Depositional isotopic fractionation takes place when iron sulfide minerals and anhydrite are formed. No isotopic fractionation occurs when supergene alunite forms due to exogene oxidation of pyrite. The temperature indicated by the isotopic equilibrium constant for the coexisting pair, anhydrite-pyrite, exceeds the temperatures measured in the drillholes. The positive $\delta^{34}S$ values for randomly selected H_2S, pyrites, and pyrrhotites, all showing a narrow spread, suggest magmatic upper crust origin of the sulfur. The origin of the SO_4^{2-} ion is uncertain. The pyrites and pyrrhotites are enriched in the heavier isotope in comparison with sulfides from most magmatic hydrothermal ore deposits which seem to derive their sulfur from upper mantle or subcrust. (auth)

45922 USE OF MINERALS CONTAINING GREAT AMOUNTS OF COMMON LEAD FOR THE DETERMINATION OF THE ABSOLUTE AGE OF POST-PROTEROZOIC FORMATIONS. Mirkina, S. L.; Makarochkin, B. A. (All-Union Geological Scientific Research Inst., Leningrad. Pedagogical State Inst., Gorno-Altai, USSR). Geokhimiya, No. 8, 917-22(Aug. 1966). (In Russian).

The possibility of using minerals which contain large amounts of common lead for the determination of the absolute age of post-proterozoic formations is confirmed, provided the following conditions are observed: the presence of a group of coeval minerals; and the application of mathematical methods of experimental data treatment. The accessory minerals from alkaline syenites of the southern part of the Middle-Ural were also investigated. (auth)

45923 EXCITATION OF SURFACE WAVES BY THE UNDERGROUND NUCLEAR EXPLOSION LONG SHOT. Liebermann, Robert C. (Columbia Univ., Palisades, N. Y.); King, Chi-Yu; Brune, James N.; Pomeroy, Paul W. Contracts AF 19(628)-4082; AF 49(638)-1337. J. Geophys. Res., 71: 4333-9(Sept. 15, 1966).

The underground nuclear explosion Long Shot, detonated beneath Amchitka Island in the Aleutian Island chain on October 29, 1965, generated surface waves equivalent to those of an earthquake of surface wave magnitude $M_s = 3.9$. The body wave magnitude for this event is $m_b = 6.1$. Comparison with earthquakes from the same geographical and tectonic region as well as comparison with the M_s versus m_b relation of Gutenberg and Richter, indicates that the surface wave generation by Long Shot was significantly less than that of earthquakes of comparable body wave magnitudes. Since the body waves from Long Shot also contain less long-period energy relative to the earthquakes, it is concluded that Long Shot did not efficiently excite the long-period part of the seismic wave spectrum. This result is in agreement with previous studies of underground nuclear explosions. (auth)

45924 OXYGEN AND HYDROGEN ISOTOPES IN NEW ZEALAND THERMAL AREAS. Banwell, C. J. (DSIR, Wellington, N. Z.). pp 95-138 of Nuclear Geology on Geothermal Areas. Pisa, Consiglio Nazionale delle Ricerche, [1964].

The abundance of oxygen and hydrogen isotopes in hydrothermal systems in the Wairakei and White Island areas is discussed. The following topics are discussed including their relation to the amounts of oxygen and hydrogen isotopes now present in these regions: (1) temperature, (2) geological structure and (3) chemistry of other elements. The isotopic content in both surface and subsurface water sources is discussed. On the basis of the reported isotopic contents of the waters, some general statements are made concerning the circulatory systems of these regions. (B.L.M.)

45925 EXAMINATION OF SULFUR ISOTOPIC RATIOS IN THE GEOTHERMAL AND VOLCANIC ENVIRONMENT. Rafter, T. A.; Wilson, S. H. (Inst. of Nuclear Sciences, Lower Hutt, N. Z.). pp 139-72 of Nuclear Geology on Geothermal Areas. Pisa, Consiglio Nazionale delle Ricerche, [1964].

Sampling methods and analyses to obtain the real sulfur isotopic ratio for the discharge from geothermal bores, volcanic fumaroles, or hot springs in the Wairakei region of New Zealand are described. Samples were taken over a 6 year period. A few samples from White Island were also included for comparison. From the tabulated analytical results and taking into account the enthalpy and bore output, the best average $\delta\ ^{34}S$ value for the hydrothermal solution at Wairakei is 12.2. From the data presented, certain conclusions are drawn concerning the underground temperature of the hot chloride water in the sampling region and the sulfur abundance in oceanic water and certain minerals. (B.L.M.)

45926 REVIEW OF THE WORK OF THE TRITIUM LABORATORY INSTITUTE OF NUCLEAR SCIENCES-NEW ZEALAND. Taylor, C. B.; Polach, H. A.; Rafter, T. A. (Inst. of Nuclear Sciences, Lower Hutt, N. Z.). pp 183-232 of Nuclear Geology on Geothermal Areas. Pisa, Consiglio Nazionale delle Ricerche, [1964].

The project for the estimation of tritium content in natural waters at the Institute of Nuclear Science in New Zealand from 1956 to 1963 is reviewed. The sampling program, sample processing, procedure for conversion of H_2O to H_2, deuterium measurements for tritium calculations, and tritium calculations are presented in detail. Several tables of results of samples from various sources throughout the years are presented. All references to previous published work is well documented for reference purposes. (B.L.M.)

45927 OCEAN MINING AND COMMERICAL RESOURCE DEVELOPMENT. Wheaton, Elmer P. pp 20-32 of Proceedings of the 1965 Conference, Atomic Industrial Forum,

Inc., Washington, D. C. McCluskey, Robert J. (ed.). New York, Atomic Industrial Forum, 1966.

Factors affecting the development of undersea mineral exploration and recovery are reviewed. The cost of using nuclear power plants in deep sea mining operations is evaluated. A conceptual design of Deep Quest, an exploratory submarine for ocean exploration is presented. (F.S.)

45928 STRONTIUM ISOTOPES IN DEEP-SEA SEDIMENTS. Dasch, E. Julius; Hills, F. Allan; Turekian, Karl K. (Yale Univ., New Haven). Science, 153: 295-7 (July 15, 1966).

Recent deep-sea sediments, leached of carbonate, have $^{87}Sr/^{86}Sr$ ratios ranging from 0.7044 to 0.7394. Strontium in the detrital sediment has not equilibrated isotopically with seawater strontium. Amounts of strontium-bearing authigenic material in the clay-mineral assemblage are not great enough to mask strontium-isotope ratios inherited from source areas. (auth)

45929 ISOTOPIC COMPOSITION OF STRONTIUM IN VOLCANIC ROCKS FROM OAHU. Powell, J. L.; DeLong, Stephen E. (Oberlin Coll., Ohio). Science, 153: 1239-42(Sept. 9, 1966).

Analysis of several well-documented specimens from each of the three volcanic series on Oahu gives the following mean ratios of ^{87}Sr to ^{86}Sr: the Waianae series, 0.7030 ± 0.00010 ($\bar{\sigma}$); the Koolau series, 0.70385 ± 0.00009 ($\bar{\sigma}$); and the Honolulu series, 0.7029 ± 0.00006 ($\bar{\sigma}$). The mean ratio of ^{87}Sr to ^{86}Sr of the Koolau series specimens is significantly higher than the means of the other two series. With one exception, significant differences in $^{87}Sr/^{86}Sr$ within a series were not found, even though some large compositional differences existed. (auth)

45930 METHOD FOR CALIBRATING A RADIOACTIVE LOGGING SYSTEM. Reed, Dale H.; Dunlap, Henry F.; Hutchinson, Thomas S.; McCallum, Robert E.; Pritchett, William C. (to The Atlantic Refining Co.). U. S. Patent 3,264,475. Aug. 2, 1966. Filed Dec. 31, 1962.

An improved calibrating method is described which produces an accurate repeatable calibration for chlorine radioactive well logging systems. The calibration method consists of a crystal for detecting gamma rays, and a pulse generator for rejecting gamma rays whose energies vary from a predetermined energy range. (F.S.)

45931 NUCLEAR MAGNETIC RESONANCE WELL LOGGING. Hoehn, Gustave L. Jr., Woessner, Donald E.; Zimmerman, John R. Jr. (to Mobil Oil Corp.). U. S. Patent 3,268,800. Aug. 23, 1966. Filed Mar. 1, 1960.

A nuclear magnetic induction process is described which provides a basis for distinguishing between oil and water in a well bore. An exploring unit is adapted for positioning at selected depths. A field coil in the exploring unit is supplied in which a high current produces a polarized magnetic field and a means of abruptly changing high current to a low current producing nuclei that precess. The Larmor precession signal is detected by a pair of coils wound and mounted to be oriented orthogonally to each other. Signals from the detector coils are sent to the surface and portrayed on a mechanical recorder. (F.S.)

Thorium and Uranium Minerals

45932 (EUR-3065.f) COMPTE-RENDU D'UN VOYAGE FAIT EN ARGENTINE, AVRIL-MAI 1965. (Report on Visit to Argentina (to Study Uranium Ore Reserves) During April-May 1965. Putzer, Hannfrit; Puibaraud, Yves; Brinck, Johan W. (Bundesanstal fuer Bodenforschung, Hanover (West Germany). Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires. European Atomic Energy Community, Brussels (Belgium). Supply Agency). 1966. 60p. Dep. mn.

A geological study of the techniques of U mining and an estimation of U reserves in Argentina are discussed. The possibility that important additional reserves will be discovered to form an export potential appears to be excellent. Proven ore reserves are ~ 9000 tons of U metal equivalent. Continued prospecting at a slightly accelerated rate should increase the reserve to the 14,000-30,000 tons required by the nuclear program in Argentina. (F.S.)

45933 ON THE GEOLOGY AND THE RADIOMETRIC SURVEY AT THE NORTH AREA OF MIZUNAMI CITY, GIFU PREFECTURE. Suzuki, Taisuke; Onoe, Toru (Geological Survey of Japan). Chishitsu Chosasho Geppo, 17: 75-86(Feb. 1966). (In Japanese).

A uranium survey was conducted in the North Area of Mizunami City where the Miocene and the Pliocene sediments are developed. All uranium-bearing sediments in this area are contained in the Toki coal-bearing formation. Five radioactive anomalous outcrops, which are named Hiraiwa outcrops Nos. 1, 2, 3, 4, and Fukazawa No. 1 have been discovered. Among them, the maximum value of uranium contents is 0.88% U_3O_8 at Hiraiwa outcrop No. 1, the second is 0.038% at Hiraiwa outcrop No. 3 and the others are lower grade according to the results of chemical analysis. These anomalous outcrops are found in places such as the ravines in the basin. It probably means that the uranium minerals fixed in present position were transported in sedimentary rocks by the action of ground water. As the uraniferous deposits are widely overlaid with sediments, it appears that further reconnaissance investigation should be done by drilling. (auth)

45934 LOS RATONES URANIUM DEPOSIT AT ALBALA (CACERES, SPAIN). Martinez, Agustin; Ramirez, Enrique (Junta de Energia Nuclear, Madrid). Energ. Nucl. (Madrid), 10: 192-203(May-June 1966). (In Spanish).

The location of the "Los Ratones" uranium mine at Albalá (Cáceres, Spain) is described from geologico-petrographic point of view. The mine itself, as well as the materials and methods used for various mining procedures, are also described. (These are the traditional methods and equipment used in an average-size uranium mine.) (G.O.Y.)

45935 URANIUM BEHAVIOR IN PROCESSES OF PROGRESSIVE METAMORPHISM AND ULTRAMETAMORPHISM AS ILLUSTRATED BY THE WESTERN PART OF THE ALDAN SHIELD. Ermolaev, N. P.; Zhidikova, A. P. (Vernadskii Inst. of Geochemistry and Analytical Chemistry, Moscow). Geokhimiya, No. 8, 900-16(Aug. 1966). (In Russian).

Uranium behavior has been studied in processes of regional rock metamorphism from amphibolite to granulite facies and in processes of migmatization and granitization of these rocks exemplified by the Aldan Precambrian as well as in processes of metamorphism from greenschist to contact-corneous facies as illustrated by the Paleozoic of the Erzgebirge. It has been established that during the progressive metamorphism, rocks lose a part of the uranium and thorium contained in them (from 20 to 40% compared to their content in rocks at the preceding stage of metamorphism). The loss of radioelements during metamorphism is correlated with the loss of water and carbon dioxide by rocks. Rocks undergoing regional progressive metamorphism may be considered an enormous potential source of matter in subsequent ore processes. (auth)

45936 STUDIES OF THE KINETICS OF ARGON ISOTOPE ISOLATION FROM URANINITES IN CONNECTION WITH THE PROBLEM OF ^{38}Ar ORIGIN. Shukolyukov, Yu. A.; Tolstikhin, I. N.; Ashkinadze, G. Sh. (Lab. of the Geology of Precambrian, Leningrad). Geokhimiya, No. 8, 923-35(Aug. 1966). (In Russian).

In three investigated uraninites from Northern Karelia, argon is enriched in the radiogenic isotopes ^{38}Ar and ^{40}Ar relatively to ^{36}Ar. Argon fractions were isolated at various temperatures. The chief part of radiogenic ^{38}Ar in uraninites is connected with the activation energy of 35-300 ccal/mol which indicates the presence of radiogenic argon atoms inside the crystal lattice. The possibility of ^{38}Ar formation at the spontaneous fission of heavy atomic nuclei is suggested. (auth)

45937 GEOLOGIYA MESTOROZHDENII URAN-MOLIBDENOVOI RUDNOI FORMATSII. (Geology of Commercial Uranium–Molybdenum Ore Deposits). Vlasov, B. P.; Volovikova, I. M.; Gladyshev, G. D.; Kazhdan, A. B.; Laverov, N. P.; Melnikov, I. V.; Tananaeva, G. A. Moscow, Atomizdat, 1966. 183p.

The conditions for hydrothermal formation of uranium beds in uranium–molybdenum deposits are discussed. Great importance is given to the characteristics of the territory where the deposits are found, to the geological structure of the mine, the field, the bed, and to the connection between mineralization and magmatic production, as well as to the mineralogical characteristics and the paragenesis of the commercial ore. The experimental results of many authors were used to compile the material for this book. (G.O.Y.)

HEALTH AND SAFETY

See also BIOLOGY AND MEDICINE — Radiation Hazards and Protection
GEOLOGY, METEOROLOGY, AND MINERALOGY — Natural Radioactivity and Fallout

Refer also to abstracts 45297, 45451, 45518, 46030, 46264, and 46994.

45938 (AD–635930) ALTERNATIVE APPROACHES TO FINANCING A NATION-WIDE SHELTER PROGRAM. A Contributing Investigation to the Area-wide Shelter Systems Study. Harvey, Ernest C. (Stanford Research Inst., Menlo Park, Calif.). Jan. 1964. Updated Apr. 1966. 97p. CFSTI $3.00 cy, $0.75 mn.

Results are presented from a preliminary examination of alternative approaches to the problem of financing a nationwide shelter system. Current practices applicable to capital investments by individuals and other segments of the private sector are discussed, some of the problems with respect to their utilization for shelter construction are listed, and incentive programs which could encourage action in this area are analyzed. In addition, local sources of funds and state and federal aid programs are discussed as a basis for evaluating the extent to which each of these levels of government could participate. With respect to federal and state programs, particular attention is given to the possibility of combining civil defense considerations with existing program objectives and to the identification of techniques that might be applicable to a separate national program designed to develop shelter capability. In general, all approaches other than one involving 100 percent federal funding appear to offer limited potential. However, several aspects of the financing problem warrant additional research prior to a national-level decision regarding financing. (auth)

45939 (AD–639594) PRELIMINARY INFRARED FIRE MAPPING SYSTEMS ANALYSIS. Final Report. Mikelonis, Eugene C.; Shearer, Richard P.; Duguay, Gretchen L. (HRB-Singer, Inc., State College, Pa.). Nov. 1965. 204p. CFSTI $6.00 cy, $1.25 mn.

An analysis is presented of the factors affecting operational use of a post-attack IR fire mapping system. Organizations that could support such an operation were determined. Based upon the employment of a specific number of IR units, the time to map all areas of interest was calculated. A "threat indifference" approach was employed to determine the areas of interest. A training program is presented for both system operators and technical personnel. Many potential peacetime applications of the system were defined. A cost analysis of the various system configurations is also given. (auth)

45940 (AD–639710) A PROTOTYPE MANUAL ON CIVIL DEFENSE ASPECTS OF WATERWORKS OPERATIONS, CONSIDERING RADIOLOGICAL RECOVERY PROCEDURES, ALTERNATE DISTRIBUTION TECHNIQUES FOR SAVING WATER, AND ANALYSIS OF BLAST VULNERABILITY OF SELECTED DISTRIBUTION SYSTEMS COMPONENTS. Phase II. (Engineering-Science, Inc., Arcadia, Calif.). Sept. 1966. Contract OCD-PS-65-15. 108p. CFSTI $4.00 cy, $0.75 mn.

This study presents information on the blast vulnerability of community water distribution pipelines, alternate operating techniques for controlling the use of water in early postattack periods, and on radiological recovery procedures and shelters available to waterworks personnel. The results of the analysis of the vulnerability of pipelines indicate that the primary mode of failure will be crushing of the pipe. The five principal alternate operating techniques considered are: isolation of portions of the distribution system; rationing consumer water use; reducing hydrostatic operating pressures; rerouting water: and the utilization of auxiliary sources of water. Planning is stressed for postattack radiological recovery procedures, such as, wet decontamination and the determination of the safe stay times for recovery personnel. It is essential to provide shelter in locations as close as possible to the designated tasks that waterworks personnel must perform in early postattack recovery situations. (auth)

45941 (AECD-HP–5) A REPORT ON THE ASSESSMENT OF RADIATION DOSES TO WORKING PERSONNELS OF VARIOUS ORGANISATIONS OF EAST PAKISTAN BY FILM BADGE MONITORING TECHNIQUE. Rab Molla, M. A.; Abdullah, S. A.; Islam, K. N. (Atomic Energy Centre, Dacca (Pakistan). Health Physics Div.). Mar. 1966. 22p. Dep. mn.

Assessment of external radiation doses from occupational exposure was made by film badge monitoring techniques in the vicinity of Dacca. Radiation doses to 94 workers from six different organizations were estimated. Out of 94 workers, one person received 50%, another 30%, and two others 20% of the maximum permissible doses (MPD) during one year of their total working period. Doses to the remainder were much below the MPD levels. It is concluded that data on exposure of workers were very encouraging from the point of view of radiation safety. (H.G.D.)

45942 (AECL–2478) ENVIRONMENTAL CONSEQUENCES OF RADIOACTIVE WASTE DISPOSAL. Ophel, I. L. (Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.). Aug. 1966. 12p. (CONF-661015–1). Dep. mn. AECL $0.50.

From National Conference on Pollution and our Environment, Montreal, Canada.

No apparent effects on humans or animals has ever been observed as the result of the disposal of radioactive wastes from the nuclear industry in Canada, or elsewhere. The only detectable effect is an increase in the pre-existing radionuclide content and radiation level of some parts of the environment. This increase in environmental radioactivity will result in an increased dose of radiation to people and other living things in the vicinity of a nuclear installation. It is this additional radiation exposure that is the effect of radioactive waste disposal. Canadian regulations state the maximum permissible doses of radiation that may be received by members of the public. In addition, the maximum concentrations of radionuclides permitted in air and water are specified. These concentrations can be used as a guide to control the amounts of radionuclides present in the dispersed wastes. Because of biological considerations, they must, however, be applied to environmental situations with caution. The direct measurement of radionuclides in environmental materials, such as air, drinking water, and milk ensure that permissible radiation doses are not exceeded. Estimates of public exposure due to waste disposal operations at the Chalk River Nuclear Laboratories are made. They show that, even under the most unfavorable circumstances, the maximum exposure of any person is less than 1% of the permissible amount. The pollution potential of power reactors is assessed and found to be very small. (auth)

45943 (AERE-PR–HPM-9) HEALTH PHYSICS AND MEDICAL DIVISION RESEARCH PROGRESS REPORT, JANUARY–DECEMBER 1965. Johnston, J. E. (ed.) (Atomic Energy Research Establishment, Harwell (England)). June 1966. 37p. Dep. BIS $1.40. HMSO 7s.

Separate abstracts were prepared on four sections of

this report. A list is included of 59 publications during the period covered by this report. (C.H.)

For abstracts of individual sections see: 45271, 45944, 46030, and 46031.

45944 (AERE-PR-HPM-9, pp 1-6) AEROSOLS. (Atomic Energy Research Establishment, Harwell (England)).

Progress is reported on investigations on the transport of aerosols to land surfaces and tracer studies on the deposition of polystyrene inhaled particles in the human respiratory tract. Data are included from studies on the velocity of the deposition of ^{131}I on grassland; wind tunnel and field experiments on the transport of small particles to natural surfaces; the transport of micron-sized droplets of ^{32}P-tri-cresyl-phosphate to vertical surfaces in tubes; the use of a Nolan-Pollak counter to measure particle concentrations in gas-cooled reactors by measuring the optical density of the fog formed when water is condensed on the particles in an adiabatic expansion; the ciliary efficiency of the upper respiratory tract of human subjects, in which 5 μm diameter ^{51}Cr-monidisperse polystyrene particles were inhaled and clearance from the lungs and respiratory tract were observed using collimated counters inside the shield of a whole-body counter; measurements of the effects of the flux of diffusing water vapor (diffusiophoresis) and temperature gradient (thermophoresis) on the velocity of aerosol particles in both air and helium; the performance of an electrolytic hygrometer for the measurement of very low humidities; measurements of the liquid/vapor partition of ^{131}I in liquid Na; measurements of the air/water partition coefficient of ^{131}I; and studies of factors affecting the washout of orango-chlorine pesticides from the atmosphere by rain. (C.H.)

45945 (AERE-R-5106(Amended)) HEALTH PHYSICS CONTROL OF BERYLLIUM AT A.E.R.E., HARWELL. Pollock, J. S.; Jones, I. S. (Atomic Energy Research Establishment, Harwell (England)). July 1966. 34p. Dep. BIS $1.80. HMSO 9s.

Work on beryllium and its compounds has been carried out at AERE Harwell for about fifteen years. Up to about two years ago smear and air samples taken in the beryllium areas were evaluated by spectrographic means. With the development of the γ-n counter a more comprehensive routine sampling program of the breathing air and surface contamination measurements in beryllium process areas was possible. Results of the monitoring program over a period of about 18 months are presented. On the basis of the work carried out, recommendations are made concerning the demarcation of beryllium areas at AERE and on the derived working limit for surface contamination at the establishment. (auth)

45946 (AHSB(RP)-M-43) FEASIBILITY STUDY OF THE USE OF P.V.C. PRESSURISED SUITS IN WORKPLACES AT TEMPERATURES OF 40 TO 50 DEG C. Rowlands, R. P. (Authority Health and Safety Branch, United Kingdom Atomic Energy Authority, Harwell (England)). Aug. 1966. 12p. Dep.

Formulas derived from experiments in which men worked in pressurized suits at ambient temperatures are extrapolated to workplace temperatures in the range 40 to 50°C. It is shown that coating a standard ventilated P.V.C. pressurized suit with radiant heat reflecting material and using a vortex tube to cool a dehumidified breathing air supply makes moderate work feasible. At the lower end of the workplace temperature range considered, the thermal conditions for the suit wearer are comfortable. With increasing workplace temperature the thermal stress on the man increases through a zone of modest discomfort to a zone of marked discomfort that is barely tolerable. Up to about 46°C exposures of a few hours appear feasible, but between 46 and 50°C it would appear prudent to limit exposures to an hour or so. Above 50°C brief exposures only are indicated. Likely values of the physiological responses, body temperature, heart rate and weight loss through sweating, are given corresponding to the different zones of thermal stress. (auth)

45947 (ARCRL-13) RADIOACTIVITY IN MILK, 1964. (Agricultural Research Council, Wantage (England). Radiobiological Lab.). Feb. 1965. 15p. Dep. mn. BIS $0.50. HMSO 2s. 6d.

Radioactivity was measured in milk between July and December 1964. No ^{131}I was detected in milk up to the middle of October. After the detonation of the Chinese nuclear device at that time, levels of ^{131}I remained below the limit of accurate detection (about 10 pC/l) although the presence of ^{131}I was indicated in one or two samples.) In the second half of 1964 there was a general decrease in the ^{137}Cs and ^{90}Sr contamination of milk. This trend was evident in all zones of the country-wide survey, and it also applied to the majority of special sites. The country-wide ratio of ^{90}Sr to Ca in milk during the last six months of 1964 averaged about two-thirds of that in the corresponding period of 1963. For the entire year the mean ratio was 28 pC ^{90}Sr g Ca. This is 17% lower than the value for the twelve months ending in June 1964 but about 10% higher than that for the whole of 1963. At special sites the twelve-month mean ratios of ^{90}Sr to Ca for 1964 ranged from about 60 to 200 pC/g compared with 60 to 210 pC/g at the same sites in 1963 and 70 to 220 pC/g for the period July 1963 to June 1964. The concentration of ^{137}Cs in milk from the country-wide survey changed in a manner similar to that of ^{90}Sr. The country-wide mean concentration for the whole of 1964 was 153 pC/l. This value is 16% lower than that for the twelve months ending in June 1964 and about 13% higher than that for the whole of 1963. At special sites the twelve-month mean concentrations for 1964 ranged from 350 to 1590 pC/l compared with 360 to 1250 pC/l for 1963 and 420 to 1580 pC/l for the period July 1963 to June 1964. As previously reported, the levels of ^{90}Sr and ^{137}Cs in milk during the first part of 1964 exceeded those at the corresponding time in 1963. Thus, despite the general decrease in the contamination of milk in the last half of 1964, the twelve-month mean values at the end of that year were in most instances slightly higher than those in 1963. However, when account is taken of the fact that the short-lived components of fallout that were present in the early part of 1963 had decayed to negligible proportions before the end of that year, it can be concluded that in 1964 the total radiation doses were of the same order as those received by the population in 1963. The Medical Research Council has concluded that radiation doses in 1963 were appreciably below the limits which it has specified for the purposes of assessment. The same conclusion is, therefore, valid for 1964. (auth)

45948 (BNL-10527) ENVIRONMENTAL MONITORING OF ^{131}I AS A VERIFICATION OF METEOROLOGICAL CALCULATIONS OF DISPERSION FROM A 100 METER STACK. Hull, A. P.; Smith, M. E. (Brookhaven National Lab., Upton, N. Y.). [1966]. Contract AT(30-2)-Gen-16. 27p. (CONF-660920-3). Dep. mn. CFSTI $2.00 cy, $0.75 mn.

From 1st International Congress of the International Radiation Protection Assn., Rome, Italy.

On March 1, 1965 an overheated sample resulted in the release of 100 mC of ^{131}I and about 1.0 C of ^{133}I from a 100-m stack. Measurements of activity at monitoring stations located from 0.7 to 2.5 km from the stack, meteorological parameters, data on known emission from the stack, estimations of ground-level concentrations, and $^{133}I/^{131}I$ ratios were used to revise estimates on the rise of the plume above the stack and for the verification of estimated environmental contamination for periods from days to years. The measurements of radioactivity at various sites revealed important features of the plume and of dispersion patterns at the site. (C.H.)

45949 (CLOR-49/D) NATURAL AND ARTIFICIAL (FROM NUCLEAR EXPLOSIONS) GAMMA BACKGROUND RADIATION IN POLAND: DOSES RECEIVED BY THE POPULATION. Pensko, J. (Centralne Laboratorium Ochrony Radiologicznej, Warsaw (Poland)). 1966. 38p. CFSTI $2.00.

The results of the environmental dose rate measurements of more important gamma emitters (natural and

fission products) for 20 different places in Poland are presented and discussed. Mainly the spectrometric method has been used and some measurements were done by means of the high pressure ionization chamber. The fission products from nuclear explosions considerably changed the natural gamma-ray background in Poland especially in summer 1963. The photopeak of Mn-54 which corresponds to the energy of 0.840 Mev was observed in the spectrograms obtained in 1964. (auth)

45950 (HASL–178) AUTOMATIC SAMPLER FOR COLLECTING RADIOACTIVE PARTICULATES IN GROUND LEVEL AIR. Freeswick, D. C. (Health and Safety Lab., New York Operations Office (AEC), N. Y.). Aug. 1966. 35p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

An air sampling system designed at the Health and Safety Laboratory will automatically collect seven 24 hour samples. It only requires changing filters twice a week, to obtain continuous daily samples. Particulate loading effects on the microsorban filters used in the system are minimized by designating an experimental value of 6 lpm/cm^2 as part of the design criteria. This flow rate per unit area results in air volumes of approximately 100 cubic meters per sample when corrected for pressure and temperature. The total volume of air per sample is calculated from data obtained by two flow rate metering devices. One of the two devices provides a permanent record of the flow rates for each sample. The bulk of the system is located indoors so that a minimum number of components require special consideration for environmental conditions. The level of radioactive detection when using a HASL designed beta scintillation counter is 0.013 pC/m^3. In the more than 16,000 hours the system has been in operation, there were only four malfunctions. One of the malfunctions, the Northeast power failure of November 9, 1965, resulted in the total loss of one sample. The samples of two other malfunctions were salvaged by using the data obtained from the recording flowmeter. The fourth sample was lost due to a component failure. (auth)

45951 (HASL–179) SPECTRAL ENERGY DISTRIBUTION OF UNFILTERED X-RAYS FROM A 250 kV CONSTANT POTENTIAL MACHINE. Shambon, Arthur (Health and Safety Lab., New York Operations Office (AEC), N. Y.). Aug. 1966. 22p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A representation of the energy distribution of four unfiltered beams from a 250 kv constant potential x-ray machine is presented. This representation is consistent with the inverse square law for attenuation of radiation with distance and with the dose rates obtained with a free air ionization chamber. By using a filtered beam and air chamber measurements at two positions in the beam, the location of the x-ray source was accurately established. It was then possible to apply the inverse square law to partial dose rates in 10 kv intervals found analytically at one position and determine attenuated partial dose rates at two other positions of the unfiltered beam. The sum of these partial dose rates was compared with free air chamber measurements of the total dose rate. The total dose rate of the filtered beam was used to calibrate a Victoreen stray radiation chamber. This calibration was compared with one obtained with NBS calibrated sources. All comparisons showed good agreement. A monitoring system was set up to provide a means to correct for small variations in the output of the machine. (auth)

45952 (HI–647-RR) METHODOLOGY FOR POSTATTACK RESEARCH. Ayres, Robert U. (Hudson Inst., Inc., Harmon-on-Hudson, N. Y.). Aug. 1, 1966. Contract OCD-PS-65-64. 48p.

The report discusses the methodology of postattack research. A hierarchical approach is described, in which the objects of analysis range from simple organisms and artifacts to complex human societies and ecosystems. The notion of "response" to a perturbation which is appropriate for simple systems is extended to encompass the wider notion of "disutility" in describing the effects of a nuclear attack on the economy or the society of the nation as a whole. The appropriate uses of devices such as scenarios, games, case histories, metaphors and models for various purposes are discussed. The major point is that non-rigorous constructs may be extremely helpful in training, raising the level of the discussion, and generating insights, but cannot be used for predictive purposes as models can. A "state-of-the-art" estimate of various models is included. (auth)

45953 (ISO-SA–23) SEALING OF PLASTIC FILM BY ELECTRONIC WELDING FOR ALPHA CONTAMINATION CONTROL. Fillmore, J. W.; Moulthrop, H. A. (Isochem Inc., Richland, Wash.). June 22, 1966. Contract AT(45-1)-1851. 27p. (CONF-661001–11). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

For Presentation at 14th Conference on Remote Systems Technology, Pittsburgh, Pa.

A simple but significant method utilized as an aid for control of alpha contamination in a plutonium manufacturing facility is the technique of electronically sealing plastic bags containing alpha radioactive contaminated articles or radioactive material. A radio frequency (RF) field and a press or sealing bar are used to seal plastic bags. The sealing bar conducts the RF field and creases the plastic to form a welded seam as the plastic film is heat softened and flows together. The equipment is portable and requires a minimum of personnel training for effective use. (auth)

45954 (LA-DC–7582) THE CONTRIBUTION OF INDUSTRIAL HYGIENE TO THE PROTECTION OF THE RADIATION WORKER. Schulte, Harry F. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [nd]. Contract W-7405-eng-36. 5p. (CONF-660910–1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Congress on Occupational Health, Vienna, Austria.

In an Atomic Energy Laboratory or Plant a number of radiation protection specialists or health physicists are employed. Another type of specialist, the industrial hygienist, may also be employed. The training of the industrial hygienist is broader and less specialized than that of the health physicist. The industrial hygienist has basic knowledge of ionizing radiation, heat, noise, light, and microwave radiation. The industrial hygienist can design sampling instruments for use in evaluating protection against radioactive materials. Air flow measurements and calibrations are basic elements in industrial hygiene. The industrial hygienist is also trained in techniques for analysis of urine for metabolites of airborne contamination. In control of hazards from airborne materials, the training of the industrial hygienist in air flow, heat transmission, metal properties and aerosol technology is essential. The health protection program should include people with this training. The radiation worker is often exposed to non-radioactive materials and factors that may cause more damage than radiation exposures. Common materials in the nuclear industry are beryllium, lead, carbon tetrachloride and benzene. (H.L.W.)

45955 (MLM–1340) NEUTRON MULTIPLICATION DETERMINATION OF ^{238}Pu DIOXIDE. Wolfe, R. A.; Kahle, J. B. (Mound Lab., Miamisburg, Ohio). Oct. 5, 1966. Contract AT(33-1)-Gen-53. 21p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A neutron multiplication experiment was performed with 21 storage capsules containing high isotopic analysis plutonium dioxide. Each storage capsule contained approximately 80 grams of the ^{238}Pu isotope. The capsules were assembled in a heterogeneous array spaced four inches center-to-center and measurements were made independently in a water and in an air medium. The results indicated that no neutron multiplication was detectable in the fully assembled array in a water medium. However, a slight neutron multiplication of 1.29 existed in the fully assembled array in an air medium. (auth)

45956 (NP–16257) ISSLEDOVANIE EKSTRAGIROVANNYKH ZUBOV KAK METOD MASSOVOGO KONTROLYA ZA SODERZHANIEM STRONTSIYA-90 V ORGANIZME LYU-

DEI. (Investigation of the Use of Extracted Teeth as a Method for Mass Control of ^{90}Sr Content in Men). Marei, A. N.; Knizhnikov, V. A.; Yartsev, E. I. (Institut Atomnoi Energii, Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow). 1965. 15p. Dep. mn.

A new method for ^{90}Sr determination was developed using teeth extracted in large numbers at stomatological institutions. Although the teeth differ from bones genetically and structurally, extensive tests showed that the accumulation of ^{90}Sr in human teeth follows the same regularities as encountered in compact, mineral-containing bones of the skeleton. The ratio between ^{90}Sr in teeth and bones shows a stable ratio during uptake that does not depend on age nor on the geographic region. Caries and chronic periodontic disease does not affect the ^{90}Sr concentration, while a decrease in such concentration in some other cases can be easily taken care of by an appropriate change in the tooth/bone ratio. Although the accumulation of ^{90}Sr is greater in children than in adults, the accumulation does not occur only during calcification but also in formation teeth (baby or permanent). (JPRS)

45957 (NYO-3364-23) RADIOCESIUM CONTAMINATION OF BEER IN NORWAY. Madshus, Kjell (Norsk Hydro's Inst. for Cancer Research, Oslo); Stroemme, Aksel (Norsk Radiumhospital, Oslo). [1966]. Contract AT(30-1)-3364. 7p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Cesium-137 concentrations in beer from four Norwegian breweries were determined as a function of seasons of production. The components of beer (water, hops, malt, and yeast) were analyzed in an effort to determine the reason why ^{137}Cs concentrations varied so markedly in beer from different breweries. Malt and hops, imported from Yugoslavia, the United States, Germany, Czechoslovakia, Denmark, and France, had ^{137}Cs concentrations averaging 352 pC/kg and 2.3 nC/kg, respectively. Cesium-137 concentrations of malt and hops did not appear to be dependent on geographic origin. Amounts of ^{137}Cs in tap water from any one district in Norway were scarcely detectable, and yeasts had very low concentrations of the radionuclide, ranging from 35 to 190 pC/kg. It is concluded that variations in ^{137}Cs content of beer from the four breweries must be due to brewing methods that influence the precipitation of ^{137}Cs before the beer is bottled. (H.G.D.)

45958 (ORNL-3973(Vol.1), pp 14-25) CRITICAL EXPERIMENTS. (Oak Ridge National Lab., Tenn.).

Criticality studies were made for a stainless-steel sphere containing UO_2F_2 solution with a ^{235}U content of 4.98%. Experiments were performed to determine the critical parameters of lattices of cylindrical annuli of uranium enriched to 1.95% in ^{235}U moderated and reflected by water. A comparison was made with experimental results of the values of k_{eff} of various hydrogen-moderated assemblies of uranium of low enrichment calculated by the 05R Monte Carlo code. Prompt-neutron decay constants were measured by the Rossi-α technique in subcritical 7-, 11-, and 15-in. diameter cylinders of enriched uranium metal (93.15% ^{235}U) of heights varying in 0.12-in. decrements from slightly subcritical to half critical. Using the measured values of β/l for delayed critical cylinders of the same diameter and calculated changes in β/l due to the decrease in height, multiplication factors were obtained. The time dependence of fission events in a subcritical assembly consisting of two coaxial 11-in.-diameter uranium (93.2% ^{235}U; $\rho = 1.87$ g/cm^3) metal cylinders 2.625 in. thick separated by 14.55 in. was measured by the Rossi-α technique. Critical experiments are reported which were performed in support of the design of the Sorgente Rapida (SORA) fast, NaK-cooled, pulsed neutron-source reactor. Experimental data is presented for criticality of arrays of enriched uranium cylinders for use in safe storage and transport of fissile materials. Results are given for a series of experiments on the critical parameters of lattices of Heat Transfer Reactor Experiment fuel elements, primarily in geometries and environments of interest for transport, storage, and chemical dissolution. (S.F.L.)

45959 (RFP-384) BERYLLIUM CONTROL AT ROCKY FLATS. Hammond, S. E.; Hill, J. E. (Rocky Flats Div., Dow Chemical Co., Golden, Colo.). Apr. 7, 1964. Contract AT(29-1)-1106. 22p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Methods for the control of Be contamination at Rocky Flats are discussed. Beryllium work at Rocky Flats includes machining, welding, casting, research and development, and analytical procedures. Most of the Be machine work is done in an isolated area and protective clothing worn during the operation are removed in the area and soaked before transportation to the laundry. The final laundry rinse is checked for Be content and spot checks of clothing are made during laundering. Daily air samples and smears taken in the laundry are also checked for Be. Every effort is made to control airborne Be at its source. Each machine or hood has an air sample head that is analyzed for Be daily, local exhaust systems have been improved, and room air and wipe surfaces are surveyed weekly for Be contamination. Ventilation systems are described and illustrated photographically and procedures used for the control of Be fires are discussed. (C.H.)

45960 (RFP-811) GLOVEBOX HANDLING OF GRAM QUANTITIES OF ^{244}Cm AT ROCKY FLATS. Kirchner, R. A.; Freiberg, K. J.; Putzier, E. A. (Rocky Flats Div., Dow Chemical Co., Golden, Colo.). Sept. 29, 1966. Contract AT(29-1)-1106. 6p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Approximately 3 grams of ^{244}Cm were processed from oxide to metal in a standard glovebox. It was demonstrated that gram amounts of ^{244}Cm can be handled safely in standard gloveboxes on a "project basis." Personnel rotation and in-box shielding were used to control exposures. The average whole body exposure for 11 persons was 298 mRem. The maximum whole body exposure was 475 mRem. Based on the exposure experience of this project, "routine" work with amounts of ^{244}Cm greater than 100 milligrams would be discouraged unless permanent shielding and remote handling facilities are available. No airborne activity was noted. No alpha contamination external to the glovebox was encountered. The inside of the glovebox and all equipment used in the project became grossly contaminated. Removal of all curium-contaminated equipment and thorough cleaning of the glovebox was necessary to reduce the external radiation to a level permissible for further routine operations. (auth)

45961 (RLO-1750-8(Vol.3), (Paper 2)) ARTIFICIAL RADIONUCLIDES IN PACIFIC SALMON. Kujala, Norman Frederick (Oregon State Univ., Corvallis. Dept. of Oceanography). 62p.

Thesis.

Pacific salmon, Oncorhynchus, concentrate certain γ-emitting radionuclides (^{65}Zn, ^{54}Mn, ^{40}K, and ^{137}Cs) in their viscera. In some cases the pattern of concentration of radionuclides seems related to the position of the fresh water plume of the Columbia River, a well known source of ^{65}Zn in the northeast Pacific Ocean. Fishes whose migratory paths are far south of the river have more ^{65}Zn, but less ^{54}Mn. In other cases concentrations can be at least partially explained by differences in feeding habits. The more carnivorous chinook and coho salmon accumulate the highest concentrations of ^{65}Zn, ^{54}Mn, and ^{137}Cs. On the other hand, the sockeye, a plankton feeder, has low radioactivity, with ^{54}Mn the dominant radionuclide, some ^{65}Zn, but no ^{137}Cs. The few chum and pink salmon examined most nearly resembled the sockeye in radioactivity. In southeastern Alaskan waters there is a distinct difference in relative abundance of ^{65}Zn and ^{54}Mn in salmon. Manganese-54 is the dominant isotope in salmon of northern Alaskan waters, and ^{65}Zn is more prominent in the spectra of fishes from Canadian and contingent United States waters. The Columbia River plume undoubtedly accounts for this increase in ^{65}Zn. To learn the effects of diet on concentration of radioactivity in salmon, stomach contents were removed and analyzed separately. Megalops crab larva concentrated ^{54}Mn and ^{65}Zn, whereas euphausiids concentrated only ^{65}Zn. Spectra of herring and

anchovies were similar to those of the salmon. Separated visceral organs, shellfish, and steelhead trout were also analyzed. The same γ emitters were present, but in differing amounts. The radioactivity of salmon viscera clearly indicates that the influence of the Columbia River is widespread. There is some possibility that ^{65}Zn and ^{54}Mn may serve as ecological tools, complementing tag studies as a means of tracing migrations. (53 references.) (auth)

45962 (RM–4827-TAB) NUCLEAR WAR AND SOIL MICROFLORA. Blumenfeld, S. N. (RAND Corp., Santa Monica, Calif.). Aug. 1966. 44p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The possibility of a pronounced, long-term reduction or modification of microbial flora as a result of nuclear bombardment, causing a derangement that would affect the ability of the soil to support the growth of crops, could have serious implications for a nation's agriculture. There are two nuclear-bombardment phenomena that could conceivably affect the soil microflora: ignition of extensive fires in forests and crops, and acute and chronic irradiation by fallout. On the basis of experimental data on the thermal sensitivity of microorganisms, soil-temperature measurements and microbial counts following fires, and experience derived from actual crop fires, it is concluded that extensive burnoff of vegetation would not evoke sufficient changes in the microflora to drastically curtail the soil's ability to support future crops. It is suggested, however, that burned-off agricultural lands be plowed as soon as possible to conserve the ash and to break up the baked crust of the soil and permit aeration. Since this study concerns radiation effects over significantly large tracts of land, it deals only with the effects of fallout radiation on the soil flora, not the initial radiation from a nuclear explosion. Experiments indicate that acute doses on the order of 10^6 R are required for sterilization of soil. In order to assess the danger to the soil microflora from nuclear attack, rough calculations were made to determine the total fission yield in surface-burst weapons required to produce radiation levels that might derange the soil ecology. In the context of present weapons, these yield requirements are huge. Moreover, at exposures far short of those that might endanger the productivity of the soil flora, other more immediate problems, such as the management of fallout radionuclides in agricultural and grazing lands, would have to be dealt with. It is very unlikely, then, that even a major nuclear war could sufficiently disrupt the soil ecology to an extent that would curtail the soil's productivity or endanger the population dependent on it. (TCO)

45963 (SZS–6/66) MODERNE METHODEN DER PERSONENDOSIMETRIE. (Modern Methods of Personnel Dosimetry). Kraus, W.; Herrmann, D.; Kiesewetter, W. (Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany)). July 1966. 48p. Dep. mn.

Physical properties of radiation detectors used in personnel dosimetry are considered. The applicability of the various dosimeters is discussed for the purposes of personnel monitoring in single institutes and in control centers, for accidental and other high level dosimetry, and for the dosimetry in natural radiation fields and in space. Difficulties in the interpretation of dosimeter responses with regard to the organ dose are briefly reviewed. (auth)

45964 (SZS–7/66) DER ^{90}Sr-GEHALT IN BOEDEN UND PFLANZEN AUF DEM TERRITORIUM DER DDR, 1964. (The ^{90}Sr Content of Soil and Plants in the Territory of the GDR (German Democratic Republic), 1964). Scheel, H.; Kunert, J. (Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany)). Aug. 1966. 20p. Dep. mn.

The results of ^{90}Sr determinations in soil and plant samples in 1964 are presented. The ^{90}Sr contamination of soil was determined to be about 30 nC/m^2. Thus in comparison to 1963 the increase was about 7.5 nC/m^2. With the exception of rye grain and cabbage no appreciable decrease of the ^{90}Sr content could be observed in dried plant materials. No change of the ^{90}Sr content could be detected in potatoes, whereas in beets even an increase of the ^{90}Sr concentration was observed. For grass, green maize, and beet tops the ratio of ^{90}Sr surface contamination to ^{90}Sr total contamination was estimated to be 69, 33, and 51 per cent, respectively. These ratios correspond to a fallout retention of 17, 8, and 6 per cent. The uptake of ^{90}Sr from soil by grass and green maize was 0.6 and 1.1 per cent. (auth)

45965 (JPRS–36843) LABOR HYGIENE AND OCCUPATIONAL DISEASES, VOL. 10, NO. 5, 1966. Translation of Gig. Trud. Prof. Zabolev., 10: No. 5, 1-64(1966). 104p. (TT–66-33273). CFSTI $4.00 cy, $0.75 mn.

Of the 19 papers included, only 1 is within the scope of NSA. An abstract has been prepared for this paper. (H.L.W.)

For an abstract of the individual paper see: 45966.

45966 (JPRS–36843, pp 60-3) RADIOLOGICAL DECONTAMINATION OF HANDS CONTACTING A CONTINUOUS-ACTION LUMINOUS COMPOUND. Arkhipov, A. S.; Bodrova, D. A.; Vershinin, N. V.; Pavlovskaya, N. A.; Skripchenko, E. S. Translated from Gig. Trud. Prof. Zabolev., 10: No. 5, 44-5(1966).

One of the health problems in industries using continuous-action luminous compounds (CALC) is contamination of working surfaces, clothes, and worker's hands. CALC consists of insoluble finely divided radium sulfate in combination with barium sulfate and zinc sulfide. After cleaning the hands with xylene and industrial soap, the residual contamination is 60%. A number of cleansing agents for cleaning hands contaminated with CALC were examined. The procedure was to measure alpha activity of the surface of the palm and fingers of both hands, washing the hands with the cleansing agent, measuring alpha activity of hands after washing, repeating the washing, measuring the alpha activity, and figuring absolute and relative residual contamination of the hands. The most effective agents were found to be those which contained adsorbents and surface-active substances, such as kaolin paste. Soaps with cationic surface-active additives, such as benzyldimethyloctadecylammonium iodide, bromide and chloride, are comparatively effective. (H.L.W.)

45967 CONTAMINATION OF SOYBEAN AND ITS PRODUCTS WITH ^{90}Sr AND ^{137}Cs. Sasaki, R. Ann. Rep. Nat. Inst. Nutr. (Tokyo), 10-12(1965).

The content of ^{137}Cs and ^{90}Sr in soybean samples collected throughout Japan in October and November 1963 was measured. The content in bean curd and various plant parts was also measured. Regional variations were found with the highest levels in samples from districts near the Japan Sea. (C.H.)

45968 ATOMIC RISK IN INDUSTRIAL MEDICINE. Marques, P.; Combe, P. F. Arch. Mal. Prof. Med. Trav. Securite Soc., 26: 513-7(Sept. 1965). (In French).

Hazards of the industrial use of radioactive materials and ionizing radiation are discussed. The major accidents which have occurred at nuclear installations are briefly described. All accidents involving radioactive materials at these installations account for less than 1% of the total number of accidents. In 1959 and 1960, 98% of workers at French nuclear plants received less than 5 Rem/yr exposure, whereas 50 persons employed at the Institut du Radium (Paris) received greater than 5 Rem/yr and in many hospitals, where precautions are not always effective, doses of 40 Rem/yr are common. Operators of fluoroscopes in the course of setting fractures over many years may accumulate doses of 15,000 to 20,000 R to the hands, and in France there are about 20,000 such fluoroscopes in use. Hazards associated with the use of the following devices in industry are described: x-ray tubes for use in metallurgy, ^{60}Co for sterilization of medical supplies, thickness gauges employing ^{90}Sr, ^{35}S, or ^{141}Cs, static electricity eliminators, and neutron activation equipment. The permissible limits of exposure for workers in various categories are given, and means for medical surveillance

of workers, to assure that they do not receive excessive exposures, are described. (BBB)

45969 SENSITOMETRIC PROPERTIES OF DENTAL X-RAY FILMS. Chong, Maxwell P.; Docking, Alan R. (Commonwealth Bureau of Dental Standards, Melbourne). Austral. Dent. J., 10: 354-60 (Oct. 1965).

In view of increasing concern in lowering patient exposure in dental radiography, while maintaining optimal image quality, a survey was made of the base-fog density, sensitivity or speed, contrast, and latitude of 7 makes of dental x-ray film. The base and fog densities of the films tested showed only small differences. While the contrast and the base and fog densities of the films are comparable, their speeds are quite different, with a large variation between the fastest and the slowest films. With the exception of two films the films could be generally classified as fast or very fast films. To obtain consistently good results with these faster films, certain technical characteristics of the x-ray machine are required. As an ideal min the machine should be capable of delivering at least 60 kvp and 10 ma, and if proper advantage is to be taken of the fast films either a fractional electronic timer should be fitted or appropriate filters used. After an evaluation of the sensitometric properties, tentative specification requirements are formulated. Using the standard conditions described for exposure and processing, the following are the suggested limits for non-screen intraoral dental x-ray film: base and fog density, max 0.25; contrast, min. 2.0; speed, reciprocal roentgens required to give a density of 1.0 above base and fog, min 4.0. If speeds of dental x-ray film can be increased in the future by improved manufacturing methods, the appropriate requirement should be amended accordingly. This should be encouraged in the interests of radiation protection. (BBB)

45970 STATE OF HEALTH OF WORKERS EXPOSED TO THE EFFECTS OF ELECTROMAGNETIC WAVES IN THE CENTIMETER AND METER RANGE. Bozik, L.; Gruberova, J.; Kolesar, D.; Szak, O. Bratisl. Lek. Listy, 45: 225-32 (Aug. 1965).

A study of 59 persons who had undergone protracted exposure to the effects of very high frequency electromagnetic radiation is reported. In a few cases, a tendency to vascular hypotonia, increased erythrocyte sedimentation rate and transaminase level, and peripheral blood changes (hyperchromic anemia, leukopenia, leukocytosis) was noted; in view of their mildness and comparative rarity, these changes are not regarded as important. Changes observed in groups exposed to centimeter wavelength radiation were statistically more significant than in the case of persons exposed to radiation in the meter range. The influence of other occupational factors (noise, unfavorable microclimate, long working hours, etc.) are considered and it is recommended that the dynamics of such changes should be studied. (Occup. Safety Health Abstr.)

45971 ORGANIZATION OF MEDICAL CONTROL AND TREATMENT OF RADIOACTIVE CONTAMINATION. Mazaury, E.; Dautheville, A. Bull. Inform. Sci. Tech. (Paris), No. 103, 13-20 (Apr. 1966). (In French).

Medical supervision methods and equipment are described. Automatic follow-up of each case of contamination detected is made. This can be an external contamination with no wound or involving a contaminated wound, in conjunction with possible or probable internal contamination by inhalation or contamination by ingestion. Systematic tests at regular intervals, indirectly by radiotoxicological examination of urine and directly by γ spectrometric whole or partial body examination, are made. (auth)

45972 OPHTHALMOLOGICAL SUPERVISION. Costeau, R.; Mazaury, E. Bull. Inform. Sci. Tech. (Paris), No. 103, 25-6 (Apr. 1966). (In French).

The importance of a preventive ophthalmological consultation within the Medical Service of an Atomic Centre is stressed. The aim of such a procedure is threefold: to show up anomalies of refraction, to track down the pathological consequences of detrimental conditions relating to industrial work, and of those connected with work on radioactive materials. (auth)

45973 SUPERVISION OF INTERNAL CONTAMINATION. Henry, Ph. Bull. Inform. Sci. Tech. (Paris), No. 103, 47-74 (Apr. 1966). (In French).

The irradiation of workers by internal radioactive contamination should be evaluated in the same way as their external irradiation as a means of checking whether standards are respected and also to supply information needed in case a medical decision is necessary. It seemed useful to compile in coherent form the ideas which deal with the fixing of standards and the evaluation of internal contamination and of doses received by critical organs. Special problems at the Marcoule Centre and the means employed to solve them are described. (auth)

45974 INFLUENCE OF URANIUM ORE MINING AND PROCESSING ON SURFACE WATERS. Havlik, B. (Ustav Hygieny, Prague). Cesk. Hyg., 10: 577-88 (Dec. 1965). (In Czech).

A study was made of the effect of uranium ore mining and processing on the contamination of surface waters with radioactive substances. Radioactivity estimations were made in an area of an old uranium mine and in a new mining area. These areas were divided into three zones according to the type of contamination, and 11 permanent sites were selected in the old mining area and 8 sites in the new mining area for the withdrawal of water samples. The contents of ^{226}Ra, ^{40}K, and of total β activity in water, sediments, and biological material were assessed. Special attention was devoted to the effects of plants concerned with the processing of ore and of the removal of waste material from these plants. An investigation was made of three types of facilities, one of which was being dismantled. Evidence of contamination by one processing plant of surface waters was demonstrated in the old mining area. The ^{226}Ra content in the terrain below the plant, as compared with the area above the plant, was 18 times greater for water and 4 times greater for soil and biological material. General principles as regards the contamination of surface waters in areas of uranium mining are expressed, with emphasis on the presence of insoluble radioactive substances. Evidence was provided that biological material, on account of its ability to accumulate radioactivity, is the most suitable indicator of contamination of water with radioactive substances. The effectiveness of a new method of decontamination in uranium-processing plants and water purification facilities was assessed. (BBB)

45975 RADIATION CONTROL IN THE DENTAL OFFICE. Yale, Seymour H. (Univ. of Illinois, Chicago). Dent. Clin. N. Amer., 355-62 (July 1961).

Recommendations are made to assist the practicing dentist in solving some of his radiation control problems through an evaluation of x-ray beam characteristics and a comparison of film speeds. Optimal reduction of radiation is dependent upon adequate filtration and collimation of the x-ray beam. Total filtration of the x-ray beam is accomplished by adding filtration in the form of aluminum disks to the existing inherent filtration. Accepted standards indicate that the total filtration should be the equivalent of 2.0 mm of aluminum. The introduction of a filtering material such as aluminum into the path of the x-ray beam serves the dual purposes of reducing the quantity of radiation and of altering its quality. Collimation, or the reduction of the dia of the beam, further reduces the quantity of x rays. Through this medium, the beam diameter is reduced to a size commensurate with the area being radiographed. A properly collimated beam will produce a bundle of x rays 2.5 in. in dia at the cone tip. The use of high-speed dental x-ray film plays an important part in the reduction of radiation. Employment of such film permits a sixfold reduction in exposure time. The increased grain size of high-speed film creates an insignificant loss of detail. An analysis of patient dose is shown for a representative 65 kvp, 10 ma dental x-ray machine collimated to produce a beam of 2.5 in. in dia at cone tip. Patient dose (expressed as cone-tip

dose) is related to the use of various combinations of x-ray beam and film speeds. The dose to patient created when inherent filtration, medium speed film, and a 2-sec exposure are used serves as a reference dose level of 100%. Exposure under these conditions produces a patient dose of 7.20 R. When 0.5 mm of aluminum filtration is added, the patient dose drops to 4.80 R, or 66.5% of the reference dose level. In using an additional 1.0 mm of aluminum filtration (total filtration now 2.0 mm) the dose is further reduced to 2.60 R, or 36.1% of the reference dose level. When fast film is used without added filtration, the patient dose is further reduced to 1.20 R, or 16.7% of the original 100% reference dose level. When total filtration is used, a reduction in patient dose to 0.43 R is accomplished, 6.0% of the original dose level. A marked reduction in radiation, both patient dose and dose rate to operator, occurs when high-speed dental x-ray film is employed. (BBB)

45976 ESTIMATION OF PERMISSIBLE α-CONTAMINATION OF SURFACES WITH EMANATING SUBSTANCES. Badin, V. I.; Tarasenko, N. Yu.; Sayapina, R. Ya. Gig. Sanit., No. 5, 40-6(May 1966). (In Russian).

The maximum permissible concentration of α surface contamination is calculated on the assumption that entry to the body takes place via the respiratory tract by means of contaminated air. The average air concentration $\overline{C}$ in C/l is given by the formula: $\overline{C} = W\ \phi\psi/V$. W is the total amount of radioactive gas or aerosol in the room; V is the volume of the room in liters; ϕ is the ratio of the amount of radioactive gas given off by the surface to the total amount of radioactive gas formed per unit time; $\psi = \lambda(\lambda + n)$ where λ is the decay constant of the radioactive gas in hr^{-1}, and n is the number of air changes per hour (instantaneous mixing is assumed). Curves of $\psi = f(n)$ are given for radon, thoron, and action. The average concentration of radon depends strongly on the number of air changes per hour, but this is not the case for thoron and actinon. The equilibrium amount of daughter products is calculated as a function of n, and it is found that the degree of equilibrium attained depends strongly on the number of air changes per hour. A relation is given between the α surface contamination of a floor in α particles $(150\ cm^2)^{-1}\ min^{-1}$, and the average air contamination $\overline{C}$ in C/l with n = 5. The maximum permissible level of surface α contamination in α particles $(150\ cm^2)^{-1}\ (min^{-1})$ is calculated to be 666,000 for natural uranium at equilibrium, 207,000 for radium bromide, 304 for thorium, 230 for radiothorium, and 1070 for protactinium. The values for uranium and radium are high because of aerosol formation, and the surface contamination should be limited to 7000 to 10,000 α particles $(150\ cm^2)^{-1}\ min^{-1}$. (TTT)

45977 EVOLUTION OF THE DOSE EQUIVALENT RATE DELIVERED TO THE THYROID GLAND AFTER INSTANTANEOUS INHALATION OF ^{132}Te. Le Grand, J.; Dousset, M. (Commissariat a l'Energie Atomique, France). Health Phys., 12: 1407-14(Oct. 1966). (In French).

A statement of the simplifying assumptions needed to establish rather simple models for the mechanisms of the routes of entrance and for the compartments within the body is given. This study then develops kinetics of the absorption of tellurium and iodine through the lung and digestive tract as routes of entrance. With the systematic application of the mathematical method of the convolution product to the several stages of the intestinal transit, the entry functions of tellurium and iodine into the body can be calculated. The differential equations corresponding to the kinetics of the four-compartment model adopted for tellurium and iodine in the body are set up and solved. Estimates of the dose-equivalent rate delivered to the thyroid by iodine-132 originating from inhaled tellurium-132 are given. Variation of this dose-rate as a function of time and its graphic representation are given also. The dose-rate passes through a maximum value equal to $4 \cdot 10^{-3}$ Rem/hr per μC of inhaled tellurium-132, approximately 13 hr after inhalation. The accumulated dose reaches a value of some 0.25 Rem/μC and half the dose is delivered during the first 60 hr. (auth)

45978 ON THE RADIATION DOSES FROM A RADIOACTIVE CLOUD AND FROM DEPOSITION OF FISSION PRODUCTS, IN THE HAZARDS EVALUATION OF NUCLEAR REACTORS. Tadmor, Jacob; Gilaad, Yigal; Galron, Haim. (Israel Atomic Energy Commission, Yavne). Health Phys., 12: 1489-93(Oct. 1966).

As part of the hazards evaluation for a nuclear reactor, the radiation doses caused by a radioactive cloud and by deposition of fission products were studied. The study was based on Sutton's diffusion equations with Chamberlain's deposition correction. It was assumed that (1) following a meltdown accident 100 percent of the noble gases, 25 percent of the halogens, 15 percent of the volatile fission products and 1 percent of the solid fission products are released from the fuel and that (2) an instantaneous source is released into the environment. (W.E.B.)

45979 ENVIRONS MONITORING AT ISPRA. De Bortoli, M.; Gaglione, P.; Gandino, C. (CCR-EURATOM, Ispra, Italy). Ing. Nucl., 7: 3-11(Jan.-Feb. 1966). (In Italian).

The monitoring program at Ispra for radioactivity control in air, atmospheric precipitations, water, and the food chain is summarized. (J.S.R.)

45980 MISSISSIPPI'S RADIATION CONTROL PROGRAM. Rester, Robert R. (State Board of Health, Jackson, Miss.). J. Miss. State Med. Ass., 4: 530-4 (Dec. 1963).

Mississippi's radiation control program is described in terms of its three main features; environmental monitoring, x-ray evaluation, and radioactive material control. The primary concerns of environmental monitoring are existing nuclear facilities, operation of fallout stations, and submission of environmental samples for radioanalysis. The x-ray evaluation program of the Radiological Health Unit concerns the greatest source of population exposure. A statewide x-ray evaluation program was conducted to provide a survey of every owner of x-ray equipment. This service was designed to detect any deficiencies in the x-ray machines and did not involve the technique or the diagnostic or therapeutic procedures of medical practice. This first phase of the x-ray evaluation program has now been completed. In the 22 months since inauguration of the plan, the State Board of Health has checked 2281 units. Even under the simple criteria established by the Board of Health, a significant percentage of the machines did not pass inspection. Items checked included: proper coning and availability of cones, adequate filtration, properly operating exposure switches, beam sizes on both fluoroscopic and radiographic units, panel-top dose rates on fluoroscopes, scatter radiation to operators and others, proper shielding of x-ray tube, cassette mountings to ensure against accidental uncontrolled area exposures, beam quality, and other items of interest. The third phase of the program, that of radioactive material control, includes the licensure and surveillance of radioactive materials previously regulated by the U. S. Atomic Energy Commission. Mississippi has assumed regulatory responsibility over byproduct, source, and special nuclear materials in quantities less than a critical mass pursuant to Public Law 86-373. (BBB)

45981 NAVAL RADIOLOGICAL PROTECTION SERVICE. Ackery, D. Melville (Royal Naval Medical School, Alverstoke, Eng.). J. Roy. Nav. Med. Serv., 51: 161-4(Summer 1965).

A description is given of the organization being set up at the Royal Naval Medical School for adequate protection to personnel from the hazards of ionizing radiation. Sources of ionizing radiation in the Royal Navy are outlined. Radioactive sources of greatly different magnitudes are used in the Navy, ranging from several thousands of Curies in the submarine reactor to a few μC in laboratory work. There are four subdivisions to the Naval Radiological Protection Service under the titles Health Physics, Medical and Biological, Administration, and Teaching. The responsibilities of the Service are shown. The Admiralty Radiation Records Centre has now been operating for 18 months and its function is to keep a permanent medico-legal record of the personal radiation doses accrued by

Navy Department personnel. It will be joined by the Photodosimetry Service which will develop the personal monitoring films and assess the radiation doses for the Records Centre. At the Medical School a semi-automatic system will operate and the data will be processed by the Portsmouth Dockyard computer. The staff of the Service will survey, on site, areas in which radioactivity is used and also will survey the land, marine, and littoral environments in the vicinity of reactor operations. (BBB)

45982 TOTAL β RADIOACTIVITY OF CERTAIN WINES FROM THE JASSY REGION. Luca, I. Lucrarile Stiint. Inst. Argon. Ion Ionescu de la Brad, Iasi, 203-9(1964). (In Rumanian).

Each variety of wine and every vineyard shows a different radioactivity content in adult plants according to the time of gathering and the means of processing. Most of their β-radioactivity is due to ^{40}K. (Romanian Sci. Abstr.)

45983 DETERMINATIONS OF URINARY TRITIUM BY MEANS OF A LIQUID SCINTILLATOR CARRIED OUT ON THE PERSONNEL OF A NUCLEAR CENTER. Giubileo, M.; Camera, V. (EURATOM, Ispra, Italy). Med. Lavoro 56: 216-21(1965). (In Italian).

Tritium concentrations were measured in the urine of employees of a nuclear center who worked around a reactor cooled and moderated by heavy water. Beta activity was measured over a nine month period using a liquid scintillation counter. In 50% of the samples examined, tritium concentrations were less than the detection threshold. The highest level found was 1.6 μC/l, a value that corresponds to 5% of the MPC. In two cases of internal contamination the biological half-life of tritium was determined to be 10 to 12 days. (H.G.D.)

45984 SPECIALLY FORMED SLIDE RULE FOR EVALUATING RADIOLOGICAL DISASTERS. Kadokawa, Masayoshi; Ishihara, Toyohiko (Japan Atomic Energy Research Inst., Tokyo). Nippon Genshiryoku Gakkaishi, 8: 361-6(July 1966). (In Japanese).

The purpose of this slide rule is to provide rapid answers to the following problems in cases of radiological disaster, with the view to optimum utilization of observed data on gamma-exposure rate obtained from field monitoring: evaluation of the release rate of fission products from the affected reactor; estimation of the extent of radiological damage, such as through inhalation of contaminated air, and extent of the area of contamination of cultivated fields; and evaluation of the amounts of fission products contained in the reactor vessel. These problems can be solved by combining the inverse function of the gamma-exposure rate distribution from the radioactive cloud with the equation of meteorological diffusion as well as with some radioecological considerations. But these calculations are very complicated and require much time and labor, unless special devices are resorted to. The present instrument was specially devised by combining the principles of the nomograph and of the slide rule so as to permit the foregoing multi-variable calculations. The problems enumerated above can be very easily solved with this slide rule. (auth)

45985 REGULATIONS AND STANDARDS FOR THE TRANSPORTATION OF RADIOACTIVE MATERIALS. Haff, K. W.; Horton, T. R. Nucl. Safety, 7: 409-13(Summer 1966).

A brief summary of current and proposed regulations and standards on transportation of radioactive materials is presented, and an attempt is made to show differences and similarities. Tables listing the agency, the regulation or standard, and a summary of the contents are included. (auth)

45986 FRC REPORT NO. 7 ON PROTECTIVE-ACTION GUIDES FOR ENVIRONMENTAL ^{89}Sr, ^{90}Sr, AND ^{137}Cs CONTAMINATION. Snyder, W. S. Nucl. Safety, 7: 413-15(Summer 1966).

Federal Radiation Council (FRC) Report No. 7 provides guidance for actions when the environment is contaminated with ^{89}Sr, ^{90}Sr, or ^{137}Cs. The actions envisaged involve changes in processing or distribution of food, diversion of products to uses other than human consumption, and the condemnation of products. Both the situation during the first 100 days following an accidental release to the environment and the longer term situation are discussed. The FRC gives recommended Protective Action Guides (PAG) only for the situation during the first year. (auth)

45987 NATIONAL AND INTERNATIONAL NUCLEAR CODES, STANDARDS, AND REGULATIONS. Cottrell, Wm. B. Nucl. Safety, 7: 415-17(Summer 1966).

The need for the more rapid development of nuclear codes, standards, and regulations both nationally and internationally is emphasized. The Compilation of U. S. Nuclear Standards set up by the ASA is discussed. Countries and international organizations which have reported nuclear standards activities are listed. (B.G.D.)

45988 HAZARD OF DISPERSED PLUTONIUM PARTICLES. Barton, C. J. Nucl. Safety, 7: 468-73(Summer 1966).

Plutonium is being used more and more frequently as a reactor fuel component. Since inhalation of particulate plutonium or plutonium compounds constitutes a well-established hazard to man, additional information regarding the production of such particulates and the specific nature of the resultant hazards is becoming increasingly important. Some recent publications have discussed the production of particulate material by oxidation of plutonium and the effects of particle size and composition on retention in the human respiratory system. Further studies are needed to develop similar information for PuO_2 and mixtures of PuO_2 with other oxides. (auth)

45989 ICRP RECOMMENDATIONS ON HANDLING AND DISPOSAL OF RADIOACTIVE MATERIALS IN HOSPITAL AND MEDICAL RESEARCH. Struxness, E. G. Nucl. Safety, 7: 474-6(Summer 1966).

The radiation-safety measures needed for medical work with sealed and unsealed sources of radioactive materials in small laboratories, clinics, and hospitals are reviewed. Detailed guidance is given by the International Commission on Radiological Protection (ICRP) on problems such as personnel monitoring, environmental monitoring, contamination control, decontamination of personnel and equipment, handling and storage of sources, and radioactive waste disposal. Conditions under which inpatients and outpatients undergoing treatment are allowed to leave the hospital and the precautions to be taken with radioactive corpses are also discussed. Recommendations in the ICRP report are based on experience in the nuclear industry and on the International Atomic Energy Agency's classification of isotopes according to relative radiotoxicity. (auth)

45990 INCIDENTS RELATED TO NUCLEAR SAFETY IN AEC OPERATIONS. Nucl. Safety, 7: 495-8(Summer 1966).

A summary is presented on nuclear-related incidents that occurred in AEC and licensee operations from July 1, 1958 through December 1964. (B.G.D.)

45991 DOSE RATE AND TOLERANCE FLUX DENSITY OF HIGH-ENERGY ELECTRONS AND GAMMA RADIATION. Tesch, Klaus (DESY, Hamburg). Nukleonik, 8: 264-6(June 1966). (In German).

The dose rate produced by 5.2-Bev electrons and by 6.3-Bev bremsstrahlung was measured in tissue-equivalent material. From this measurement and known low-energy data the particle flux corresponding to a dose rate of 2.5 mRem/hr were determined for electrons, γ rays, and bremsstrahlung with energies up to 10 Bev. (auth)

45992 COMPARISON OF OUTPUT DOSES BY VARIOUS DOSIMETERS. Takeshita, Kenji; Sawada, Shozo; Sunayashiki, Tadashi (Hiroshima Univ.). Proc. Res. Inst. Nucl. Med. Biol., No. 7, 44-53(1966). (In Japanese).

Readings of various uncalibrated thimble chambers were compared for various geometrical radiation fields, source-surface distances, and angularity to beam axis, using a ^{60}Co teletherapy unit. Doses obtained under similar conditions

showed deviations of several per cent, and their ratios to values obtained using a Radocon 606 ranged from 0.84 to 1.27. The characteristics of each chamber for various fields and source-surface distances are shown in accompanying graphs. The differences are most likely due to the characteristics of the uncalibrated chambers rather than due to errors in measurement. With all chambers, dose rate was directly proportional to field size, as expected, because of scattered radiation and stem effect, but deserves further study to detect any other causes. (auth)

45993 SUPERVISION OF PERSONNEL DOSAGE. Wachsmann, F. (Univ., Erlangen, Ger.). Radiologe, 4: 359-62(Nov. 1964). (In German).

There are several ways to reduce or exclude the energy dependency of film emulsions. Among these are compensatory filters, the dual film process, combination of film with organic scintillators, and an analytical filter technique. The latter method permits the quality of the irradiation dose to be ascertained and thus permits steps to be taken to avoid similar radiation. The measurement range can be extended from a few mR to about 1000 R for β radiation and for thermal or fast neutrons. The results of 12 yr of radiation protection supervision in Germany indicate that doses received from diagnosis are about equal to those received during therapy. Overexposure in these fields of radiation use are similar to those in industry and reactor operations. For example, in 1963 a dose of 3 Rem/13 weeks was exceeded in 0.35% of the total number of people supervised, and a dose of 5 Rem/yr was exceeded in 0.26% of the number supervised. Overexposures are more frequent when Ra is used, particularly in gynecological practice. The 3 Rem/13 week dose was exceeded by 0.72%, and the 5 Rem/yr dose was exceeded by 0.7%. In comparison to 1959, when the corresponding figures for Ra overexposure were 6.5% and 1.7%, the later figures represent a considerable improvement. (BBB)

45994 DANGERS OF IONIZING RADIATIONS. II. Kaufmann, Ernst. Riv. Ing. Nucl., No. 3, 3-14(Mar. 1966). (In Italian).

A study was made of the dangers of ionizing radiations. The concept of maximum permissible dose and concentration of radioisotopes is defined. The uses of radiations in industry and the sources of danger are examined and discussed with emphasis on industrial radiography. (J.S.R.)

45995 PHYSICAL AND BIOLOGICAL BASIS OF RADIATION LEGISLATION. Eaves, G. (Univ. of Leeds, Eng.). Roy. Soc. Health J., 85: 414-17(Nov.-Dec. 1965).

Salient features of British radiation legislation are described. Existing British legislation already contains much of the power necessary to cover injury and damage by radiation. There is, in Common Law, the means of recovery of damage for injury by negligence. However, the law as it originally stood did not take into account the long-term darger of genetic damage to the race nor did it allow for the possibly extremely long incubation period of radiation-induced cancers. The dangers of radiation, both long-term and otherwise, are recognized by the introduction into the legislation of the concept of absolute (or strict) liability. The other modification is the extension of the limitation period of three years. The legislation contains clauses requiring that certain types of users of radiation shall be insured up to a substantial amount (five million pounds) and that, in addition, claims in excess of the available coverage shall be met from Government funds. Much of the rest of the legislation is similar to legislation in respect of other dangerous substances. It is the three points above which are of particular interest. (BBB)

45996 RADIUM CONTENTS OF THE GANGES WATER. Banerjee, Partha; Chatterjee, S. D. (Jadavpur Univ., Calcutta). Sci. Cult. (Calcutta), 32: 178-80(Apr. 1966).

The radium-226 content of the Ganges River water was determined at 9 places. Sampling and detection methods are described and results are compared with radium-226 content of other rivers. (F.S.)

45997 WORKING CONDITIONS FOR PERSONNEL ENGAGED IN ACTIVITIES INVOLVING APPLICATIONS OF IONIZING RADIATION. Baramidze, T. G.; Katamadze, N. M. (Inst. of Oncology, Tbilisi, USSR). Soobshch. Akad. Nauk Gruz. SSR, 40: 463-9(Nov. 1965). (In Russian).

The exposure to radiation and state of health of medical and auxiliary personnel employed at the radiological, x-ray diagnostic, and x- and gamma-therapeutic subdivisions of the Scientific Research Institute of Oncology and the Oncological Dispensary of the Ministry of Health, Georgian SSR, were studied. Individual dosimeters placed in the breast pocket or in protective gloves at the level of the wrist were applied and periodic blood tests carried out. Determination of the daily, weekly, and monthly doses to which the employees were exposed indicated that the permissible level of exposure was not exceeded as a rule, although there were some exceptions. Leukocytosis was encountered in 22.5% of cases. It was generally exhibited by persons employed in the type of work in question up to 3 to 6 years: persons employed for periods longer than that had leukopenia. In 9% of cases (six persons), pronounced leukopenia was observed (3,000 to 3,500 cells per mm^3), but the condition was transient and did not involve radiation sickness. In 12% of cases the reaction of erythrocyte sedimentation was accelerated. On the basis of the observations made, use of equipment for remote control in connection with the washing of Ra applicators employed in the gynecological division of the Institute of Oncology is recommended and also the use of screens to protect personnel. (auth)

45998 PERSONAL DOSIMETRY IN AN X-RAY DEPARTMENT. Sedlacek, F. Vojenske Zdravot. Listy, 34: 221-6(Oct. 1965).

Experiences in the use of film badge dosimeters with an exposure period of 1 year by the staff of a radiological department are presented. In order to assess the accuracy of this method of dosimetry, comparisons were made with pocket dosimeters and with measurements made by random sampling in the vicinity of an x-ray apparatus. The tests confirmed the value of film badge dosimetry as a very economical and reliable method of measuring individual radiation dose, which can be recommended for use at all workplaces in a radiological laboratory. (Occup. Safety Health Abstr.)

45999 STUDIES OF DECONTAMINATION PROCEDURES OF CATCHMENT BASIN WATERS WITH RAPID FILTRATION INSTALLATIONS. Bernhardt, H.; Hartmann, H.; Baumgaertel, F. (Technische Hochschule, Brunswick). Vom Wasser, 31: 85-107(1964). (In German).

The degree of removal of radiostrontium from water by sodium aluminate is 45% in the neutral range, which is greater than that by flocculation with iron salts at strongly alkaline pH. The degree of decontamination possible with flocculation and precipitation procedures at drinking water purification plants is not greater than 95% for Sr nuclides. Special procedures designed to equal or exceed this value, which require addition of large amounts of chemicals that make rapid filtration operation without retention in a sedimentation basin impossible, are impractical because of the nature of the added chemicals. Under certain conditions use of ion exchange resins appears to be reasonable. A combination of sand filter and ion exchanger as a rapid filtration aggregate that retains properties of a rapid filter may be practical. The degree of decontamination of this combination is ±99.8% or more, and is independent of pretreatment of raw water with various flocculation and precipitation procedures carried out at pH range of 7 to 11. Even after Ca breakthrough of the exchanger, it still has decontamination value. The passage time delay amounts to 30% when the activity breakthrough is 5%, corresponding to a 95% decontamination. The taste of water purified by flocculation followed by ion exchange is not adversely affected. The ion exchange process increases the Na ion concentration in purified water to 50 or 55 mg/l. A filter installation using NaCl for regeneration

and washup is described. The use of a sand filter and ion exchanger in a rapid filtration aggregate for very soft surface waters found in almost all catchment areas of Germany is an effective procedure for decontamination. Cost comparisons with other methods of decontamination now known are given. (BBB)

46000 MEDICAL RADIATION PROTECTION IN NUCLEAR PHYSICS PLANTS IN THE U.S.A. Biese, A.; Peters, Th. (Innenministerium des Landes Nordrhein-Westfalen, Dusseldorf). Zentralbl. Arbeitsmed. Arbeitsschutz, 15: 57-62(Mar. 1965). (In German).

Standards for protection against radiation as practiced in various nuclear research installations in the United States are reviewed and discussed. The information presented resulted from a survey trip through the installations. Installations included the Atomic Energy Commission, Washington, D. C., the nuclear power plant of the Consolidated Edison Co., Indian Point, N. Y., the Dresden power plant of the Commonwealth Edison Company, Morris, Illinois, Vallecitos Atomic Laboratory, General Electric Co., San Jose, Calif., John Jay Hopkins Laboratory, General Atomic Division of General Dynamics, San Diego, Calif., Atomics International, Canoga Park, Los Angeles, Calif., the National Reactor Testing Station, Idaho Falls, Idaho, and the Yankee Atomic Power Plant, Rowe, Mass. Limits of exposure, maximum permissible concentrations, and special precautions for protection against high-level radiation are reviewed. (BBB)

46001 EVALUATION OF ENVIRONMENTAL RADIOACTIVITY IN THE VICINITY OF NUCLEAR PLANTS. Marley, W. G. (United Kingdom Atomic Energy Authority, London). 13p. (CONF-631111-3). ORAU.

From International Symposium on Radioactive Contamination of the Human Environment, Hiroshima.

Hazards from radioactivity in the vicinity of nuclear plants are evaluated in terms of control measures initiated in the United Kingdom. Tissue dose in man, the basic concept in the control of environmental radioactivity, and the maximum permissible levels adopted from nuclear personnel are related to ICRP standards. Calculations involving stack disposal of ^{131}I, contamination of aquatic and marine environments by fission products, accidental release of radioactivity, and carcinogenic effects of ^{131}I in the thyroid of children are discussed. (H.G.D.)

46002 REVIEW OF REGULATIONS GOVERNING THE SHIPMENT OF NUCLEAR MATERIAL. Black, William F. (Association of American Railroads, New York). 18p. (CONF-660616-2). ORAU. Gmelin, AED-CONF-66-185-2.

From Institute of Nuclear Materials Management 7th Annual Meeting, Columbus, Ohio.

Development by the Bureau of Explosives, Assn. of American Railroads, of safe and economically sound regulations governing the packaging and shipment of radioactive materials is discussed, and the current status of the Interstate Commerce Commission regulations for radioactive materials, especially fissile materials or special nuclear materials is presented. Success of the Bureau of Explosives in evaluating packaging and shipping procedures for radioactive materials is evaluated. (H.G.D.)

46003 RADIOLOGICAL HEALTH PROBLEMS ASSOCIATED WITH THE USE OF RADIOISOTOPES. Tompkins, Paul C. (Federal Radiation Council, Washington, D. C.). 19p. (CONF-660207-5). ORAU. Gmelin, AED-CONF-66-011-4.

From Radioisotope Applications in Aerospace Symposium, Dayton, Ohio.

Radiological health problems resulting from the use of radioisotopes are considered from the standpoints of conceivable personal exposure, risk to populations from normal use and in the event of an accident, and protective measures indicated by use. The notion is advanced that the development and use of radioisotopes in any application, including aerospace applications, present no purely technical problems that differ in kind from those that have already been met and solved during the development of present technology. Development of standards and procedures for radioisotope use up to the present time are reviewed. It is concluded that dispersion of multi MC quantities of long-lived isotopes into the environment during space missions is unwise in view of the consequences following malfunction or failure of space vehicles. (H.G.D.)

46004 TEXAS ENVIRONMENTAL SURVEILLANCE PROGRAM. Barden, Charles R.; Wukasch, Martin C.; Flora, David H.; Stanko, James J. (Texas State Dept. of Health, Austin). 23p. (CONF-660621-11). ORAU. Gmelin, AED-CONF-66-193-3.

From 11th Annual Meeting Health Physics Society, Houston, Tex.

The radiological environmental surveillance program of the Texas State Department of Health is reviewed. The radioanalysis laboratory has capabilities for performing low background β counting, γ pulse height analysis, and radiochemical separation procedures. In cooperation with various local health departments and the US Public Health Service environmental samples are collected and analyzed for components resulting from nuclear weapons testing or the release of radioactive material from industries or research facilities. Samples of air, milk, and oysters are analyzed routinely. The influence of the wide variations of meteriological parameters with both geographic position and season of the year on fallout deposition is discussed. (C.H.)

46005 ADMINISTRATION OF RADIOLOGICAL HEALTH PROGRAMS WITHIN THE STATE GOVERNMENT. Pickard, Ralph C.; Fry, Richard M. (Kentucky Health Dept., Frankfort). 7p. (CONF-651060-10). ORAU. Gmelin, AED-CONF-65-318-12.

From American Public Health Association, 93rd Annual Meeting, Chicago.

Administration of radiological health programs in state health departments is considered from the standpoints of staff, facilities, equipment, budget, operation, and legislative control. It is suggested that success of a radiological health program depends entirely upon the budget and technical reservoir available to the program. (H.G.D.)

46006 CODE OF PRACTICE FOR THE PROTECTION OF PERSONS EXPOSED TO IONISING RADIATIONS IN RESEARCH AND TEACHING. London, Her Majesty's Stationery Office, 1964. 64p. 4s. 6d.

General principles of radiation protection are discussed in reference to administrative organization, suitability of buildings for work with ionizing radiation, medical supervision of employees, emergency procedures, storage of sealed and unsealed sources, transport of radioactive materials, and disposal of radioactive wastes. Specific guidelines are established for work involving sealed and unsealed sources, x-ray installations, and nuclear reactors and criticality experiments. (H.G.D.)

46007 IMPROVEMENTS IN OR RELATING TO POWDERS FOR EXTINGUISHING FIRES. Clements, Henry George (to United Kingdom Atomic Energy Authority). British Patent 1,041,747. Sept. 7, 1966. Filed June 12, 1962.

A fire extinguishing powder for use with metallic fires of Zr, Mg, or U consists of a mixture of chloride and fluoride salts of the alkali or alkaline earth metals together with less than 20 wt % of either anhydrous borax or a non-flammable synthetic resin to serve as a binder when the powder is in use to blanket a fire. (B.L.M.)

INSTRUMENTATION

General

Refer also to abstracts 46105, 46114, 46497, 46537, 46832, and 46968.

46008 (BNL–10626) TUNNEL DIODE PULSE SHAPE DISCRIMINATOR. Soucek, Branko (Brookhaven National Lab., Upton, N. Y.). [1966]. Contract AT(30-2)-Gen-16. 15p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A pulse shape discriminator with wide dynamic range is described. The discriminator has been used for separating the scintillation signals from particles with different specific ionization, in connection with fast 56 AVP and RCA 7267 photomultiplier tubes. For the signal amplitudes in the range from 50 mv to 5 v, the time shift of the output discriminator pulse for a given sort of particles is about ±1 nanosec. The circuit has also been used for neutron spectrometry, using proportional counters, and for separation of thermal neutrons, with glass beads-plastic scintillators. (auth)

46009 (BNWL–299) DUAL ONE DIMENSIONAL ANALYSIS AND DISPLAY PROGRAM. Samsky, D. N. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). Sept. 1966. Contract AT(45-1)-1830. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A computer program (DODAD) was written for simultaneous analysis of two independent signals in two 1024 channel analyzers. The program was written for use with the combination of a PDP-8 and a modified ND-160F analog to digital converter. (B.G.D.)

46010 (CEA-R-2970) REALISATION D'UNE JAUGE A FLUORESCENCE β-X POUR L'ANALYSE CHIMIQUE. (Construction of a β-X Fluorescence Gauge for Chemical Analysis). Leontiadis, Ioannis (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). June 1966. 60p. Dep. mn.

Thesis. Submitted to Univ., Paris, France.

A theoretical and experimental study of phenomena occurring when beta radiation from a radioactive source causes x fluorescence in the atoms of a sample is discussed. A semi-empirical equation is put forward for calculating the intensity of the photoelectric peaks caused by the elements which are being determined. The set-up proposed has a much better performance than that of previous β-x equipment. It is now possible to apply this new method both to chemical determinations and to layer-thickness measurements. The process has proved to be slightly more satisfactory than that using tritium-on-zirconium sources for producing x excitation. An extension of this work is proposed for the case where the matrix effects are taken into account for determining the contents. (auth)

46011 (EUR–3117.e) AN INTEGRATING STORAGE DISPLAY MONITOR WITH DARK-TRACE TUBE FOR NUCLEAR TWO-PARAMETER SPECTRA. Rieb, D.; Stueber, W. (European Atomic Energy Community, Geel (Belgium). Central Nuclear Measurements Bureau). June 22, 1966. 34p. Dep. mn.

The necessity and possibility of a monitoring device for sorted display of unsorted nuclear event data during or after their recording on magnetic tape are discussed. A dark-trace storage tube is proposed for this purpose and the main characteristics of such a tube are studied. The operation and the circuits of a developmental storage monitor are described. The investigations have shown that a sorting storage monitor unit is feasible, but that the dark-trace tube is not well suited because of its logarithmic integration characteristic. According to the published characteristics of charge picture storage tubes it is supposed that such a tube will give a much better result, and therefore an investigation of a charge picture storage tube with a nominal diameter of 10 in. is in preparation. (auth)

46012 (INR–697/XIV/PS) SYMMETRICAL BACK-REFLECTION FOCUSING CAMERA COMBINED WITH X-RAY MICROFOCUS TUBE. Baran, Z.; Stanek, A. (Institute of Nuclear Research, Warsaw (Poland)). Mar. 1966. 12p. Dep.

An x ray symmetrical back-reflection focusing camera is described which includes the following construction assemblies: cross-table with vertical shaft, hinge-like camera clamp, focusing camera (diameter = 114.6 mm), adjustable rotating specimen clamp, and specimen driving section (speed 3 rpm). (B.G.D.)

46013 (RFP–622) A THERMOGRAVIMETRIC BALANCE FOR RADIOACTIVE SAMPLES IN A HYDROGEN FLUORIDE ATMOSPHERE. Troutman, H. A.; Moseley, J. D. (Rocky Flats Div., Dow Chemical Co., Golden, Colo.). Nov. 4, 1965. Contract AT(29-1)-1106. 14p. (CONF-651107–2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From American Chemical Society, 1st Midwest Regional Meeting, Kansas City, Mo.

Requirements for and schematic of a custom built thermogravimetric balance are given. The equipment and innovations necessary to produce thermograms from reaction of radioactive samples with a hydrogen fluoride atmosphere are described. The method used for alignment of the balance sample pan with the reactor is outlined. Details are given concerning maintaining inert purge gas in the balance bell jar while hydrogen fluoride is passed through the reactor. The safety shutdown system is detailed. Typical performance curves are included. (auth)

46014 (SC-TM–65-289) ELECTROMECHANICAL REMOTE POSITION SENSOR. Windle, W. F. (Sandia Corp., Albuquerque, N. Mex.). July 1965. Contract AT(29-1)-789. 22p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A feasibility study of an electromechanical remote position sensor intended for the remote setting of an electromechanical timer is discussed. The position sensor uses a transistor voltage comparison circuit to compare resistances (and thus mechanical position) of two 10-turn pots in a resistance bridge. Two variations of the resistance bridge, and two variations of the voltage comparison circuit are presented. (auth)

46015 (TRG-Report–933(Pt.1)) STANDARD RELAY MODULES FOR SAFETY AND CONTROL CIRCUITS. PART 1. GENERAL DESCRIPTION. Maple, B. J.; Cooper, A. G. (Reactor Group, United Kingdom Atomic Energy Authority, Risley (England)). Mar. 21, 1965. 8p. Dep. BIS $0.60. HMSO 3s.

Standard relay modules have been designed to meet the need for relay logic on experimental plants. The design can be constructed without prior knowledge of the plant requirements and can be made to suit a particular application by the simple expedient of arranging links in a removable connector. A general description of the unit, and an instruction and maintenance manual are presented. (auth)

46016 (UCRL–14734) BRAKE SYSTEM FOR MASTER-SLAVE MANIPULATORS. Stearns, E. H. (Lawrence Radiation Lab., Univ. of California, Livermore). Mar. 3, 1966. Contract W-7405-eng-48. 11p. (CONF-661001–3). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 14th Conference on Remote Systems and Technology, Pittsburgh, Pa.

To make operation of master-slave manipulators easier, an air brake system was devised in which a sequence-indexing circuit is used. This circuit is similar to one found on the present manipulators manufactured by Central Research Laboratory (CRL). A selector trigger was devised which selects the indexing motions desired and also the brake. Lights indicate which of these selections has

been made. When the brake has been selected, the indexing trigger actuates a solenoid air valve. This valve can either be a normally open or a normally closed valve, depending upon whether a failsafe system is desired. The valve stays activated until the indexing trigger is depressed, thus deactivating the solenoid. This releases the brakes completely. (B.G.D.)

46017 (UCRL–16982) AUTOMATIC ACCELERATION AND SPEED CONTROL FOR AN ANALYTIC ULTRACENTRIFUGE. Windsor, Alfred A.; Rich, Thomas H.; Doyle, Robert E.; Lindgren, Frank T. (Lawrence Radiation Lab., Univ. of California, Berkeley). Aug. 12, 1966. Contract W-7405-eng-48. 12p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A complete profile of automatic acceleration is established with an electronic speed-control system. Motor current is controlled by a Sola (resonant transformer) resonant current source during acceleration; when the rotor reaches full speed the Sola saturates, forming a constant-voltage regulator. As full speed is approached, a closed-loop system is introduced which compares the frequency of a magnetic-gear-tooth counter to a reference circuit and then applies the error as voltage increments to the drive motor. To evaluate performance, a computer program was developed to compare manual control with the automated system. Results indicate greater accuracy in the automated system for the integrated $\omega^2 dt$ during the acceleration phase of ultracentrifuge operation, and extremely stable and accurate control of final speed (10 ppm). (auth)

46018 (UCRL–70016) LOCK-IN AMPLIFIER USED IN ATOMIC CROSS-SECTION MEASUREMENTS. Ducote, Louis W. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 33p. (CONF-661016–6). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

A system is described for the detection of signals in a noise background. Ionization, excitation, and polarization cross sections can be detected at low levels with the aid of instruments such as mass spectrometers, monochromators and phase-lock amplifier systems. The electronics used for this type measurement include the following: r-f source, wide-band amplifier, narrow-band amplifier, phase detector, phase shifter, integrator, d-c amplifier, mixer, multivibrator, and harmonic generator. These circuits and their characteristics are described. An a-c line-locked closed-loop system will also be described as part of the detection system. (auth)

46019 (NP-tr–1427) METHOD TO IMPROVE THE DIFFERENTIAL LINEARITY OF ANALOGUE DIGITAL CONVERTERS AND RELATED APPARATUS. Gatti, E.; Svelto, V.; Cottini, C. Translated by A. Crozy (Atomic Energy Research Establishment, Harwell, Eng.), from Italian Patent 699,271. 6p. Dep. mn. JCL $1.10 fs, $0.80 mf.

A method is described for improving the differential linearity of analog-to-digital converters characterized by the fact that for classification of a set of pulses with a particular amplitude spectrum, where one fraction of them belongs to a given channel is determined, instead of always using the thresholds of the channel considered, by using pairs of thresholds related to a set of channels. These thresholds are obtained by translation of assigned quantities according to an assigned sequential or random law; this translation is taken care of by a correction made numerically for the coded value. (B.G.D.)

46020 BINARY-QUINARY DIFFERENCE COUNTER. Markov, Anton; Sebestyen, Bela. At. Kozlem., 8: 115-22 (June 1966). (In Hungarian).

A description is given of a binary-quinary decadic difference-counter. By some reconstruction the circuit can be transformed into a reversible or a simple counter. The work was carried out in Dubna as a part of cooperation on the field of nuclear electronics between the Joint Institute of Nuclear Research and the Institute of Nuclear Research of the Hungarian Academy of Sciences. (auth)

46021 THE MASS PER UNIT AREA MEASURED BY MEANS OF MULTIPLE BETA-RAY SOURCES. Dietzsch, W. (VEB Vakutronik WIB, Dresden). Isotopenpraxis, 2: 82-9(Feb. 1966). (In German).

The sensitivity attainable in measuring the mass per unit area by means of multiple sources of β-rays is described. Utilization of these sources in industrial devices is discussed. The use of multiple β-emitters was shown to be preferable to the use of a single β emitter. Measurement errors using multiple emitters, however, are higher than or at least equal to those observed, when the most advantageous single β source is used. Range measurement may be changed by varying the ratio of the activities of the nuclides used in the multiple source. The sensitivity response corresponding to any multiple source may be determined with sufficient accuracy from the sensitivity responses plotted for the single nuclides. Finally, formulas are given for the systematic error and the change of sensitivity, which is inevitable when, in industrial uses of the devices, the ratio of the detector signals caused by the different nuclides is not constant for long periods of time. (auth)

46022 ON THE INDUSTRIAL APPLICATION OF HUMIDITY MEASURING DEVICES UTILIZING NEUTRON BACKSCATTERING TECHNIQUE. Loeber, Chr. (VEB Vakutronik WIB, Dresden). Isotopenpraxis 2: 96-101(Feb. 1966). (In German).

The advantages of measuring the humidity of loose materials by neutron reflection is discussed. The principles of operation, experimental arrangements, and applications of the technique to the determination of the chemical composition and density of materials are described. Construction and operation of a stationary humidity measuring device is also discussed. Practical sensitivity obtainable is calculated, and the maximum error of humidity measurements on fine-grained sand is evaluated. (auth)

46023 STUDY ON CIRCUIT CONSTRUCTION OF SINGLE-CHANNEL PULSE-HEIGHT ANALYZER. Kariya, Komyo; Aoki, Yasusi (Ritumeikan Univ., Japan). Oyo Butsuri, 35: 336-45(May 1966). (In Japanese).

The elements which determine the reliability and stability of a single channel pulse height analyzer are influenced by the change of room temperature when all the circuits are made up of the semiconductors. For the temperature characteristic of semiconductor elements, it is important to discuss the static characteristic that determines the operation point of circuit. The single channel pulse height analyzer is composed of three clippers of the same type and a different type clipper. If the d-c level of two kinds of input signals for the clip points of all the clippers is changed similarly by the room temperature, the output signals at the clip points do not change. In this study, the stability within 0.02%/°C on base line and channel width was confirmed. (NSA of Japan)

46024 β-RAY THICKNESS GAUGE TYPE TAI-21. Kinoshita, Katsuhiro; Miyake, Toshiyuki (Shimadzu Seisakusho Ltd., Japan). Shimazu-Hyoron, 23: 15-24(Mar. 1966). (In Japanese).

A β-ray thickness gage used in manufacturing plastic film, metal foil, paper, etc., is described. The design, principles of operation, and construction of the new model Shimadzu β-ray thickness gage Type TAI-21 are described. (auth)

46025 SELECTION OF THE LOCATION AND GEOMETRY OF THE IONIZATION REGION OF FLIGHT MASS SPECTROMETER. Martynkevich, G. M. Tr. Tsentr. Aerol. Observ., 56: 32-7(1964). (In Russian).

The factors affecting the selection of the most rational location and geometry of ionizing electron beams in flight mass spectrometers designed for the measurement of the partial concentration of atmospheric components in the

upper levels were examined. It was shown that installation of this beam on the surface in the inlet aperture of the mass spectrometer is the most convenient. (tr-auth)

46026 DIRECT READING BETA RAY COMPARATOR. Lieber, Sidney U.; Leiner, Jerome (to Unit Process Assemblies, Inc.). U. S. Patent 3,271,572. Sept. 6, 1966. Filed Aug. 24, 1962.

A beta ray comparator consisting of a beta source, detector, and translation device used in measuring the thickness of thin coatings on a basal substrate by beta particle reflection or backscatter is described. The beta source is a low activity radioactive isotope, the Geiger tube detector is placed below the source. Pulses from the detector is the input for the translation device which is comprised of a cathode follower, single shot multivibrator, integrator, timer, vacuum tube voltmeter and an auxiliary direct reading scale plate. (F.S.)

46027 INDUSTRIAL-PROCESS-TYPE MEASUREMENTS EMPLOYING GAMMA-RAY BACKSCATTERING. Crump, Jack G. (to Nuclear-Chicago Corp.). U. S. Patent 3,270,203. Aug. 30, 1966. Filed Oct. 8, 1962.

A method for measuring the density of bulk materials using Compton scattering is described. The equipment consists of a suitable gamma source such as ^{137}Cs of about ½ curie; a collimator to produce a beam of radiation of about 35° in width; and a high-pressure high-efficiency ionization detector 3 in. in dia, and 12 in. long. The detector and source are shielded from each other so that the detector receives only scattered radiation. Detector output is connected to a vibrating condenser type electrometer. Sensitive measurements can be made with the source about ¼ in. above the materials to be measured. (F.S.)

Radiation Detection

Refer also to abstract 46244.

46028 (AD–639048) NEP-12: A COMPUTER PROGRAM FOR NUCLEAR EMULSIONS. Mancuso, Richard V.; Barrows, Austin W. (Army Nuclear Defense Lab., Edgewood Arsenal, Md.). Sept. 1966. 29p. (NDL-TM-34). CFSTI $2.00 cy, $0.50 mn.

A code is described which calculates neutron energy from knock-on proton track length and orientation in nuclear research emulsions. The code contains a sorting routine which sorts the neutron energies into preselected energy intervals, and a plotting routine which plots the neutron energy spectrum. The code may be used for any emulsion by calling the appropriate subroutine which contains the range-energy relation for the emulsion used. The program is applicable to any experiment where a neutron energy spectrum is desired. (auth)

46029 (AD–639587) SOLID-STATE ELECTROMETER FOR PORTABLE RADIATION MONITOR. Nirschl, Joseph C. (Army Electronics Command, Fort Monmouth, N. J.). Aug. 1966. 19p. (ECOM–2736). CFSTI $1.00 cy, $0.50 mn.

A solid-state electrometer is described in which a Metal-Oxide Semiconductor Field Effect Transistor (MOSFET) is employed in the high impedance input stage. The range of current measurement is from 10^{-12} Amperes to 10^{-8} Amperes. The design of this electrometer lends itself to application in a portable radiation survey meter, affording high linearity, fast response, instant warm-up, and low power consumption. (auth)

46030 (AERE-PR–HPM-9, pp 6-17) RADIATION PHYSICS. (Atomic Energy Research Establishment, Harwell (England)).

The problem of personnel neutron dosimeters was explored. It was concluded that cadmium-covered film dosimeters are satisfactory except for the 10 to 300 kvp range where the $^{113}Cd(n,\gamma)^{114}Cd$ or $^{14}N(n,p)^{14}C$ reactions way be used. Sulfur pellets in the personnel dosimeter used for criticality dosimetry (using the $^{32}S(n,p)^{32}P$ reaction) provided readings as low as 0.3 to 0.6 rad by a combination of burning the pellet in an Al container to remove the S and counting on a lead backscattering disk. Sodium oleate-filled cylindrical phantoms and sodium nitrate-filled chest phantoms were compared after exposure to 2.5-Mev neutrons and results showed that S capture probability was equal in both phantoms, implying that doses derived from dosimeters on cylindrical phantoms may be extrapolated to personnel. A tissue-equivalent ionization chamber for combined measurements of absorbed dose-rate and quality factor was designed for use in measurements in pulsed and continuous fields of fast neutrons and heavy particles with relativistic velocities. The effects of anoxia on somatic mutation yield in flowers of Tradescantia exposed to 200-kev x radiation were measured using lithium fluoride thermoluminescent detectors as dosimeters. The spectrum of x rays was measured with a NaI crystal detector with a specially designed collimator. A cloud chamber based on glass fiber molding was constructed and operated at pressures in the 10 to 50 cm Hg range. Preliminary experiments indicated that a 2-Mev proton beam passed through a 10^{-5} cm thick gold foil resulted in a uniform spread over a diameter of 3 cm and adequate reduction of the beam flux at a distance of 18 meters for use in obtaining different values of linear energy transfer in the algae Chlamydomonas. Toads were irradiated and then measured for Na content by chemical methods and neutron activation analysis. Satisfactory agreement was obtained. Results are reported on performance tests of fully automatic personnel dosimeters, β dosimeters, thermoluminescent dosimeters, and photographic film dosimeters. Automatic proton track counting in nuclear emulsions used as neutron dosimeters was investigated and improvements were made in the proton track counter. The application of computer methods to γ spectrometry was expanded. Results are included from measurements of environmental background radiation at Grove, Berkshire during 1961. The radioactive content of a series of soils originating from different rock types was determined by spectrometry. Neutron activation analysis was used to determine the content of certain trace elements in airborne particulate material collected on filters and also to determine the content of Cs and Rb in 50 body tissues from cadavers. Data are included from measurements of radioactivity due to fallout in samples of air and of rain water collected at 8 stations in Great Britain and at 20 stations overseas during 1965. Emphasis was placed on the content of ^{137}Cs, ^{90}Sr, ^{7}Be, ^{210}Pb, and ^{210}Po in rain water and ^{140}Ba, ^{7}Be, ^{210}Pb, and ^{210}Po in air samples. (C.H.)

46031 (AERE-PR–HPM-9, pp 17-26) BODY RADIOACTIVITY MEASUREMENTS. (Atomic Energy Research Establishment, Harwell (England)).

Design modifications are reported in whole-body x counting instruments employing scintillation detectors. Applications reported include measurements of fallout ^{137}Cs content in adults, children, and pregnant women; estimates of the average hydrogen content of adult males and females; the distribution and retention of tracer doses of injected ^{133}Ba, ^{85}Sr, ^{47}Ca, and ^{223}Ra in man; the retention of inhaled 5 μm polystyrene particles labeled with ^{51}Cr in the lungs of man; measurement of the biological half lives of ^{231}Pm and its daughter ^{227}Ac in man after contamination by a puncture wound of the hand; the retention of inhaled ^{227}Th and its daughter ^{223}Ra in the lungs; the retention of inhaled ^{239}Pu in the lungs; the retention of inhaled ^{231}Pa containing ^{227}Ac in the lungs; the retention of inhaled ^{60}Co in the lungs; and measurements of the whole-body content of ^{226}Ra and ^{90}Sr in two subjects with long-standing body burdens. The availability of Fe added to flour from bread was assessed in normal and anemic individuals by a double tracer technique employing ^{55}Fe and ^{59}Fe as tracers and whole-body counting. Four short computer programs were written to manipulate γ spectra in various ways. (C.H.)

46032 (AERE-R-5225) A COMPACT ELECTRONIC UNIT FOR USE WITH SCINTILLATION DETECTORS (THE HARWELL 2000 SERIES TYPE 2179). Pickup, J.; Snelling, G. F. (Atomic Energy Research Establishment, Harwell (England)). July 1966. 40p. Dep. BIS $1.10. HMSO 5s. 6d.

The electronic equipment used with a scintillation detector usually comprises a head amplifier adjacent to the detector, a general purpose main amplifier and a general purpose EHT generator. Such a system of units is ideal for experimental work where the type of detector is liable to be changed, but in many applications this flexibility is unnecessary and a less costly and complicated system can be used. A relatively inexpensive unit is described which combines the main functions of the system, but designed to meet the specific needs of NaI(Tl) scintillation detectors. A particular feature of the design is that no amplifier adjacent to the detector is required, the only coupling to the detector being a single coaxial cable whose length is not critical. (auth)

46033 (ANL-7226) CHARGE COLLECTION AND CHARGE-COLLECTION TIME IN SEMICONDUCTOR PARTICLE DETECTORS. Hansen, Niels J. (Argonne National Lab., Ill.). June 1966. Contract W-31-109-eng-38. 27p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Charge collection in semiconductor junction and lithium-drifted, charged-particle detectors was investigated. Analytical solutions were obtained for the charge collected as a function of time and for the charge-collection times in terms of a parameter $\beta_0 = x_0/D$, the reduced range of the incident ionizing particle. It is assumed that the stopping power, dE/dx, of the detector is constant, that there is no loss of carriers by trapping or recombination, and that the mobilities of the carriers are constant, independent of the field strength. The implications of these simplifying assumptions are discussed. Figures are presented to illustrate the dependence of the pulse shape on the parameter β_0, and optimum operating conditions for the detectors are established. The effect on the collection time of the high fields in the ionization column is estimated. (auth)

46034 (AWRE-NR-3/66) LARGE VOLUME LITHIUM DRIFTED GERMANIUM DIODES FOR GAMMA RAY SPECTROSCOPY. Muggleton, A. H. F. (Atomic Weapons Research Establishment, Aldermaston (England)). Oct. 1966. 20p. Dep. mn. BIS $0.60. HMSO 3s.

Coaxial, lithium drifted germanium diodes with sensitive volumes greater than 17 cc were manufactured and tested as γ ray spectrometers. Detailed fabrication techniques are described together with details of detector performance. (auth)

46035 (BNL-9065) HIGH-ENERGY PHYSICS WITH THE BROOKHAVEN 80-IN. HYDROGEN BUBBLE CHAMBER. Bamberger, J. A.; Brown, D. P.; Fowler, W. B.; Goodzeit, C. L.; Richardson, C. R.; Shutt, R. P.; Tuttle, W. A. (Brookhaven National Lab., Upton, N. Y.). July 22, 1966. Contract AT(30-2)-Gen-16. 48p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A summary is presented on the development and operation of the BNL 80 in. bubble chamber for use in high energy physics. (B.G.D.)

46036 (BNL-10474) THE CRYOGENIC BUBBLE CHAMBER: AN ACCELERATOR RESEARCH FACILITY. Jensen, J. E. (Brookhaven National Lab., Upton, N. Y.). May 1966. Contract AT-30-2-GEN-16. 24p. (CONF-661102-6). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From American Society of Mechanical Engineers, Winter Annual Conference, New York.

A description of the 80 inch cryogenic bubble chamber facility at BNL is presented. The operation and research programs are briefly discussed. Future bubble chambers are also described. (B.G.D.)

46037 (BNL-10576) DIGITIZED SPARK CHAMBERS AT BNL. Fischer, Joachim (Brookhaven National Lab., Upton, N. Y.). [1966]. Contract AT(30-2)-Gen-16. 17p. (CONF-660918-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Instrumentation for High Energy Physics, Stanford, Calif.

The development of digitized spark chambers at BNL is summarized. Topics discussed are new materials and scattering of printed planes, low mass wire planes, large size printed planes, pulsed electrodes with core read out, planes with 40 conductors/inch, operating characteristics, spatial and time resolution, applications and systems data, and growth trends. (B.G.D.)

46038 (CEA-R-3034) ETUDE MULTIPARAMETRIQUE DE γ DE CAPTURE. (Multi-Parameter Study of Capture Gammas). Samama, Roland; Nifenecker, Herve; Carlos, Pierre; Delaitre, Bernard (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). June 1966. 20p. Dep. mn.

A description is presented of equipment which is intended for analyzing, recording, and reading simultaneous information from several γ detectors. It allows multiparameter study of γ-γ cascades emitted after thermal neutrons capture. (auth)

46039 (DP-1035) NEUTRON COUNTER FOR ANALYTICAL APPLICATIONS. Herold, T. Richard; Holcomb, H. Perry (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). Aug. 1966. Contract AT(07-2)-1. 18p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A neutron counter was developed to assay rapidly and nondestructively such radionuclides as ^{244}Cm and ^{252}Cf by counting the spontaneous fission neutrons that these isotopes emit. Neutrons are thermalized in a polyethylene moderator assembly and counted with BF_3 detectors spaced in the moderator. The counter background is 4 counts/minute and the counting efficiency is 4%. The reliable detection limit is 4×10^{-7} g for ^{244}Cm and 1.2×10^{-12} g for ^{252}Cf. (auth)

46040 (EGG-1183-1056) PRINCIPLES OF POSITIVE EXPONENTIAL CIRCUITS. Second Edition. Technical Memo No. L-87. Cochrane, D. O. (Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev.). June 10, 1964. Contract AT(29-1)-1183. 41p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

An introduction to the principles of positive exponential signals, the response of circuits to it, and some of the circuits used with it is presented. Topics discussed are the law of growth, positive exponential electrical waveforms, circuit response, cable response, amplifiers, signal generators, and discriminators. (B.G.D.)

46041 (FEI-37) METOD STABILIZATSII STSINTILLYATSIONNOGO SPEKTROMETRA. (A Method of Stabilization of Scintillation Spectrometers). Kononov, V. N.; Metlev, A. A.; Shorin, V. S. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Obninsk. Fiziko-Energeticheskii Institut). 1966. 12p. Dep. mn.

Following a brief discussion of various problems of scintillation spectrometer stabilization, a digital stabilization system of a multichannel analyzer based on the differential counting rate is described. The reference peak is produced by a light flash generator which uses a glow thyratron. The pulsed light source has no statistical spread of pulse amplitudes and allows placement of the reference peak in any energy region of the spectrum. The light signals are accompanied by generator pulses making anticoincidence arrangements possible. The reference pulse amplitude drift is suppressed by a self-stabilized generator with negative feedback which is also described in detail. A test comparison of the counting rate of the eighty-first and eighty-third analyzer channel with a 15 v bias was carried out with a 250 c/sec load in the peak and a 60 c/sec rate in the reference channels; the amplitude of the light flash corresponded to 10 Mev with a 3% half-width; the stabilization factor was 35. (TSS)

46042 (HASL-177) POINT SOURCE DETECTION BY SCINTILLATION SURVEY METER. Graveson, Robert T. (Health and Safety Lab., New York Operations Office (AEC), N. Y.). July 1966. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

While the scintillation survey meter displays high sensitivity to gamma radiation, its ability to locate small radioactive sources is limited. The parameters controlling detected count rate such as detector size, quantum efficiency, and the effect of pulse height discrimination have been explored with respect to sodium iodide phosphors. The analysis of the statistical variability of ratemeter readings is related to the minimum increase in count rate necessary for reliable detection. Also, the effect of relative motion between the source and the survey meter as it affects detection sensitivity has been related to ratemeter response time. Empirical as well as rigorous relationships are derived and used to accurately predict the performance of several sizes of scintillation detectors. (auth)

46043 (MLM–1339) NEUTRON SPECTROMETER UTILIZING THE PRINCIPLE OF CHARGED PARTICLE COLLIMATION. Wolfe, Richard A.; Stubbins, Warren Fenton (Mound Lab., Miamisburg, Ohio). May 27, 1966. Contract AT(33-1)-Gen-53. 39p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Two different experimental neutron spectrometers were developed using the principle of charged-particle collimation to improve the resolution in neutron detection. The thick spectrometer containing a 1.02×10^{-2} cm thick ^{6}Li metal target and two copper collimators showed the neutron energy resolution of approximately 170 kev or 1.5 percent when detecting 14.7 Mev neutrons. The thin spectrometer containing a 6.0×10^{-5} cm thick ^{6}LiF target and a single collimator was tested with thermal neutrons. Measurements with the thin spectrometer established that the copper collimator significantly improved the energy resolution of thermal neutron detection by about 30 percent. The spectrometers were maintained under a vacuum during all the measurements to prevent oxidation of the lithium metal and to eliminate the energy loss of the charged particles due to collision with gas while traversing the collimators. The experiments revealed that an arrangement which separated the two surface barrier detectors by a finite distance was equivalent to charged-particle collimation and provided an alternate means of improving the energy resolution of neutron spectrometers. (auth)

46044 (NYO–3246-6) STUDY OF SURFACE CONTOURING AS APPLIED TO SEMICONDUCTOR RADIATION DETECTORS. Semiannual Report, July 1965–December 1965. Huth, Gerald C. (General Electric Co., Philadelphia, Pa. Missile and Space Div.). Jan. 1966. Contract AT(30-1)-3246. 77p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

A report is presented on a study of carrier multiplication phenomena in a particular silicon diffused junction radiation detector and the applications of the detector. A systemized characterization of the contoured structure is discussed. Detection and potentially interesting spectroscopy of soft x rays is also reported. (B.G.D.)

46045 (NYO–3246-7) STUDY OF SURFACE CONTOURING AS APPLIED TO SEMICONDUCTOR RADIATION DETECTORS. Three Year Summary Report, 1963–1966. (General Electric Co., Philadelphia, Pa. Missile and Space Div.). June 1966. Contract AT(30-1)-3246. 28p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A summary is presented on work accomplished on determining the usefulness of surface contouring as applied to semiconductor radiation detectors. Topics discussed are contouring and junction perfection, contoured internally amplifying detectors, and specific measurements which utilize the contoured detector. (B.G.D.)

46046 (NYO–3246-8) STUDY OF SURFACE CONTOURING AS APPLIED TO SEMICONDUCTOR RADIATION DETECTORS. Semiannual Report, January–June 1966. Huth, Gerald C. (General Electric Co., Philadelphia, Pa. Missile and Space Div.). July 1966. Contract AT(30-1)-3246. 51p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

A study of semiconductor physics and application of avalanching or internal amplification in silicon junction detectors is presented with emphasis on surface contoured detectors. The characteristics and detection capabilities of the contoured detector-tunnel diode circuit are investigated. (B.G.D.)

46047 (ORNL–3893) ABSOLUTE EFFICIENCY MEASUREMENTS OF NE-213 ORGANIC PHOSPHORS FOR DETECTING 14.4- AND 2.6-Mev NEUTRONS. Love, T. A.; Santoro, R. T.; Peelle, R. W.; Hill, N. W. (Oak Ridge National Lab., Tenn.). Sept. 1966. Contract W-7405-eng-26. 43p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

The absolute efficiency of two NE-213 organic scintillators for detecting 2.6- and 14.4-Mev neutrons was determined by the associated particle technique with the recoil particles from the $D(d,n)^{3}He$ and $T(d,n)^{4}He$ reactions. The scintillators are 12 cm in diameter and have thicknesses of 2.61 and 6.10 cm. The efficiency measurements, the detector arrangement, and the function of the associated electronic circuitry, including the pulse-crossover-time pulse-shape discrimination system and the fast circuits used to time helium recoils in a thin silicon detector are described. The output of the neutron detector was placed in coincidence with the helium recoil pulses, and the efficiency of the detector was obtained as the ratio of the coincidence counts to the helium recoil counts. Measurements were made as a function of the bias level of a tunnel diode driven by the current pulse from dynode 14 of a 58AVP multiplier phototube and also as a function of a bias threshold on the total light output. The bias level was calibrated in terms of pulse-height spectra resulting from interactions in the phosphors of gamma rays of various energies. The results given are for a detector system which included a 5-mm NE-102 slab in front of the NE-213 scintillator and a 3.3-cm (average thickness) Lucite light pipe. Results are given for specified fast-light thresholds and for total light thresholds above about 160-kev electron-equivalent. Comparisons are made between experimental results and results obtained by Monte Carlo analysis. For a threshold of 400 ± 5 kev electron total light equivalent, typical measured detection efficiencies for the smaller detector are 0.122 ± 0.001 and 0.092 ± 0.001 for 2.66- and 14.4-Mev neutrons, respectively. Corresponding calculated values are 0.114 ± 0.001 and 0.095 ± 0.001. For the larger detector the measured efficiencies are 0.245 ± 0.001 and 0.203 ± 0.001 for 2.66- and 14.4-Mev neutrons, respectively, and the calculated values are 0.247 ± 0.003 and 0.200 ± 0.002. (auth)

46048 (ORNL–3973(Vol.1), pp 60-4) RADIATION DETECTOR STUDIES. (Oak Ridge National Lab., Tenn.).

Brief summaries are given of the development of an epithermal neutron spectrometer; design of a highly sensitive, isotropically responding fast-neutron dosimeter; development of instrument-response unfolding methods; and neutron spectrometry with bulk liquid organic scintillators. (S.F.L.)

46049 (ORNL–3973(Vol.2), pp 96-103) RADIATION DETECTOR STUDIES. [PART] II. (Oak Ridge National Lab., Tenn.).

Experiments were performed to determine satisfactory amplifier and signal circuit configurations for simultaneous connection of fast and slow amplifier systems to semiconductor detectors. Time-of-flight techniques were used to measure the differential cross sections for production of neutrons resulting from the interactions of 160-Mev protons with target nuclei. As part of the analysis of these data, a study was made to determine the time response function for monoenergetic neutrons in the experimental geometry. (S.F.L.)

46050 (UCRL–14651) THE FABRICATION OF SHALLOW, DIFFUSED SILICON DIODES. Kalibjian, R.; Henz, J. P. (Lawrence Radiation Lab., Univ. of California, Livermore). Apr. 22, 1966. Contract W-7405-eng-48. 16p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A detailed description of the fabrication of shallow, diffused silicon diodes is presented. For 0.021-in. thick wafers with a guard-ring geometry, the breakdown voltage of the diodes is in the 500 to 800 v range with the leakage current in the 10^{-7} A range. (auth)

46051 (UCRL–16718) HIGH-VOLTAGE LITHIUM-DRIFTED SILICON DETECTORS. Lothrop, Robert P.;

Goulding, F. S (Lawrence Radiation Lab., Univ. of California, Berkeley). Apr. 1966. Contract W-7405-eng-48. 13p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A double-drifted geometry, which may take several forms, is described. The geometry makes possible the very-high-voltage operation of lithium-drifted silicon radiation detectors. (auth)

46052 (UCRL-16814) COMPUTER-CONTROLLED 4096-CHANNEL SEMICONDUCTOR DETECTOR SYSTEM WITH STABILIZATION. Swierkowski, Stefan P.; Lafore, Robert W. (Lawrence Radiation Lab., Univ. of California, Berkeley). May 18, 1966. Contract W-7405-eng-48. 18p. (CONF-661007-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Institute of Electrical and Electronics Engineers, 22nd National Electronics Conference and Exhibits, Chicago, Ill.

The construction and operation of the hardware and software that constitutes a 4,906 channel bistabilized pulse-height analyzer, data processing, and control system are described. The system was designed for studying γ-ray spectra at the 184 in. cyclotron. (auth)

46053 (UCRL-17114) STATUS AND FUTURE PLANS FOR LRL FLYING SPOT DIGITIZER. White, Howard S. (Lawrence Radiation Lab., Univ. of California, Berkeley). Sept. 1966. Contract W-7405-eng-48. 11p. (CONF-660918-5). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Instrumentation for High Energy Physics, Stanford, Calif.

The operation of the Berkeley flying spot digitizer during the past three years is summarized. (B.G.D.)

46054 (UCRL-17121) DEVELOPMENTS IN MAGNETOSTRICTIVE READOUTS FOR SPARK CHAMBERS. Perez-Mendez, Victor (Lawrence Radiation Lab., Univ. of California, Berkeley). Sept. 1966. Contract W-7405-eng-48. 4p. (CONF-660918-4). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Instrumentation for High Energy Physics, Stanford, Calif.

A review is presented on some of the performance characteristics and some of the more recent developments in magnetostrictive readouts for wire chambers developed at LRL. (B.G.D.)

46055 (Y-MA-901) A REVIEW OF GAMMA COUNTING EXPERIENCE FOR HETEROGENEOUS MATERIALS IN THE OAK RIDGE Y-12 PLANT. Barkman, J. R. (Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant). Sept. 23, 1966. Contract W-7405-eng-26. 8p. (CONF-661011-4). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From AEC Contractors' Nuclear Materials Management Meeting, Berkeley, Calif.

Three methods of gamma counting of heterogeneous material are described. These are: portable meters, a moving-belt counter, and a counter designed to accommodate 55-gallon drums. (B.G.D.)

46056 (NP-tr-1428) SOME REMARKS ON A DEFINITE HIGH SOLID ANGLE AND VERY PRECISE α-COUNTER. Perolat, J. P. Translated by R. A. Slingo (Atomic Energy Research Establishment, Harwell, Eng.), from a Belgian Report. 16p. Dep. mn. JCL $1.60 fs, $0.80 mf.

A description of a definite high solid angle alpha counter is presented including detector, electronics, vacuum chamber, its geometry, and performance in measuring activity of americium-241. (B.G.D.)

46057 THERMOLUMINESCENT DOSIMETRY. Schayes, R. Atompraxis, 12: 409-13(Aug. 1966). (In German).

The dosimeter uses a miniature radio tube enclosed in a metal sheath provided with a plastic stopper. The thermoluminescent crystalline matter is spread on a small hollow metal cylinder and is heated electrically by a filament located inside the cylinder. The reader includes as main circuits the dosimeter heating circuit, a photomultiplier to transform the very small amount of light emitted during the heating into an electrical current and a measuring circuit indicating the dose received by the dosimeter on an instrument with scale divided in R or mR. There are two kinds of readers. The first one is principally designed to meet the severe conditions of field use and operates from a 12 v battery. It permits the reading of doses from 1 to 1,000 R, in 4 ranges; the second one, designed for laboratory use, permits the reading of doses from a few mR to 5 R (in 4 ranges). These properties make the dosimeter suitable for the surveillance of scientific personnel subjected to ionizing radiations and for use by civil defense and military personnel in the event of nuclear conflict. (auth)

46058 WARNING SYSTEM FOR RADIATION PROTECTION. Haetty, A.; Pychlau, H.; Pychlau, P. (Physikalisch-Technischen Werkstaetten, Pychlau KG, Freiburg i. B.). Atompraxis, 12: 414-5(Aug. 1966). (In German).

A warning system for radiation protection is described which consists of a central unit and several ionization chambers. The chambers are filled with gas under pressure, and are placed in areas which require monitoring. Each chamber has a registration attachment to the central unit. Various dose-output levels are measured by determining the length of time in which a dose of 0.1 mR is accumulated. The measured dose-outputs are registered and recorded in a simple manner by means of a time-printer. In addition to registering dose-output thresholds, the system also integrally measures the dose at the individual sites where the ionization chambers are located. The circuitry of the system has special advantages in monitoring large areas. (auth)

46059 DOSIMETRY OF NEUTRONS IN RADIOBIOLOGY. Broerse, J. J. Atoomenergie Haar Toepass., 8: 149-57 (July 1966). (In Dutch).

The measurement of neutron doses on a macroscopic scale were described. After a description of a tissue-equivalent ionization chamber, the results of comparative measurements by the ionization method and the activation method were described. The results of measurements of the dose absorbed in biological objects were considered. (tr-auth)

46060 ASINI: A PROGRAM FOR INVESTIGATING AUTOMATIC SCANNING OF BUBBLE CHAMBER PHOTOGRAPHS. De Lotto, I. (Centro Informazioni Studi Esperienze, Milan); Ghirardi, A.; Grasselli, A. Calcolo, 1: 1-18(Dec. 1963).

A program for investigating the capabilities of automatic scanning of bubble chamber photographs is described. The program consists of two routines: the first (PHOTO) simulates the operation of a film-reading device; the second (ASINI: Automatic Scanning and Identification of Nuclear Interactions) identifies the tracks on the pictures simulated by PHOTO. Experimental results demonstrated the value of the proposed recognition method. An automatic scanning instrument, consisting in a film-reading device (flying-spot scanner) controlled by a digital computer, is being developed. The scope of the project is a preliminary investigation on the capabilities and limitations of automatic scanning. The ASINI program is written for the Olivetti 6001. The program should ultimately control the reading device, to which the computer will be coupled; however, since the flying spot scanner has not yet been completed, the PHOTO program simulates in the computer memory a portion of a bubble chamber photograph. The design and operation of the system are described. (BBB)

46061 COMPUTER PROGRAM FOR INVESTIGATING AUTOMATIC SCANNING OF BUBBLE CHAMBER PHOTOGRAPHS. De Lotto, I.; Ghirardi, A.; Grasselli, A. (Centro Informazioni Studi Esperienze, Milan). Calculo, 1: 233-45(July-Dec. 1964).

An automatic scanning system and a computer program (ASINI 1) to test the system on simulated data were previously developed by the authors. A second version of the program was written (ASINI 2) which embodies more so-

phisticated tracking techniques. Furthermore, simulated photographs in ASINI 2 have dimensions approaching those of real photographs. Experimental results are discussed, and the limitations of the present program in automatic scanning of real photographs are pointed out. Simulated photographs in ASINI 1 are arrays of 200 × 50 points; these limited array dimensions allowed only a gross evaluation of program performances. In particular, long tracks could not be evaluated. The array size in ASINI 2 is 630 × 110: the length of simulated tracks therefore approaches that of real ones. In ASINI 2, track curvature can be evaluated with good precision, and it can be used as a parameter in the tracking routine. This is particularly useful in the presence of ambiguities, like intersecting or tangent tracks. In ASINI 1 the tracking routine did not take into account track curvature. Four samples of tracks processed by ASINI 2 are illustrated. With the samples processed by ASINI 2, no limitations in the performances of the program were observed, except those due to lack of information about track ionization. The examination of real photographs requires that the identification of track segments be implemented by analog means, but this analog scope observation technique was not simulated in ASINI because of its complexity. Analog observation would presumably resolve most ambiguous situations. The examination of real photographs requires, furthermore, a more accurate evaluation of end points, to make possible event identification, and also to prevent short prongs originating from the end point of another track from being ignored. End-point evaluation can be made relatively straightforward by employing a rotating segment in scope observation. In the simulated photographs track widths are quite uniform. Only in regions of tangency or regions where two tracks intersect at a small angle do there appear track segments of a width much greater than normal. Nonuniformity of track widths in real photographs requires that the width of the track be evaluated during tracking. (BBB)

46062 APPLICATION OF SOLID IONOGRAPHIC DETECTORS TO THE STUDY OF FISSION OF HEAVY NUCLEI. Debeauvais, Monique; Stein, Roland; Remy, Gerard; Ralarosy, Jarno (Centre de Recherches Nucleaires, Strasbourg). Compt. Rend., Ser. B, 263: 398-401(Aug. 1, 1966). (In French).

The preliminary results of a methodological study of the possibility of using solid ionographic detectors in investigating the fission of heavy nuclei are presented. The technique involved is one of sandwiching targets between plastics and obtaining the traces of the fission fragments and of the heavy ionizing particles. (G.O.Y.)

46063 A GAMMA MONITOR WITH AN AIR-WALL IONIZATION CHAMBER IN A NEHER-WHITE CIRCUIT. Bensch, Friedrich; Weiss, Harold (Atominstitut der Oesterreichischen Hochschulen, Vienna). Elektrotech. Masch., 83: 365-8(June 1966). (In German).

A monitor with a plastic wall is described, which was developed for use in a radiation warning system. The equipment permits measurement of the γ intensity in terms of roentgen units over 8 orders of magnitudes. The ionization chamber and the electrometer tube used are operated with a free grid. A sectional drawing of the ionization chamber and steel housing is presented, showing ionization chamber, protective ring, electrometer tube, etc. A characteristic curve of ionization current and chamber voltage for a dose rate of 1 R/hr is presented. In operation, the free grid of an electrometer tube increases to a potential of ~2v, at which the grid current becomes zero. This potential corresponds to the value of the anode current. With a closed chamber the grid potential is altered by the charge carriers produced by ionization and collected on the collecting electrode. Because the collecting electrode is negatively charged compared to the chamber wall, essentially positive ions contribute to the grid potential. A greater dose rate also produces a positive grid potential and thus a higher anode current. The block diagram of the ionization chamber amplifier is shown, in addition to the amplifier circuit itself. Some of the errors of measurement found during operation are reported, and methods to prevent them are briefly outlined. (BBB)

46064 METHOD OF PULSE-HEIGHT WEIGHTING USING THE DISCRIMINATION BIAS MODULATION. Moriuchi, Shigeru; Miyanaga, Ichiro (Japan Atomic Energy Research Inst., Tokyo). Health Phys., 12: 1481-7(Oct, 1966).

A method of automatic pulse height weighting using the discrimination bias modulation is described to determine the radiation dose from the pulse distribution produced from a certain type of detector. The method is to modify the energy response of a detector, based on sampling the pulses of the radiation according to their heights through the time-gate consisting of the a-c wave as a bias which simulates a suitable conversion function. An application of the method to a NaI scintillation counter is described, together with its circuit arrangements and the experimental results of the exposure measurement from several γ-sources by using it. Possible application of the method is discussed in the field of radiation dosimetry, in connection with Hurst and Ritchie's generalized concept of radiation dosimetry. (auth)

46065 NUCLEAR RADIATION PERTURBATION OF A SEMICONDUCTOR-FILLED MICROWAVE CAVITY. Haden, C. R.; Shockley, T. D. Jr. (Univ. of Oklahoma, Norman). IEEE (Inst. Elec. Electron. Eng.) Trans. Microwave Theory Tech., MTT-14: 347-9(July 1966).

Utilization of the microwave properties of semiconductors for the detection and the counting of high-energy particle radiation is discussed. Conventional techniques used in particle detecting and energy spectroscopy involve the use of d-c mode counters. Particles impinge upon a semiconductor, as a simple block or in the form of a reverse biased p-n diode. The radiation-induced charge carriers are swept to electrodes, collected, and counted. Failure to collect all the charge can depreciate the signal amplitude and the energy resolution of the system. An a-c mode counter, on the other hand, relies upon the change in the complex dielectric properties of the semiconductor. One technique which might be utilized in a-c mode counting might depend on the power loss resulting from the perturbation of a cavity containing the semiconductor sample. This perturbation of a semiconductor-filled microwave cavity by nuclear radiation particles is considered as a possible means of radiation counting. The transverse electric to $\underline{r}(TE_r)$ mode equations for a spherical cavity are summarized, and the charge diffusion-recombination equation is solved for this spherical geometry. The case of a spherical cavity operating in the TE_{011} mode, with the charge ionization occurring at the center, is analyzed. Through the utilization of a semisteady-state approach, a normalized expression for the power change as a function of time is obtained. This quantitative description for the output pulse shape is applied to the case of high-purity CdS at a frequency of 46.5 Gc. (BBB)

46066 A 4π G-M FLOW COUNTER WITH BUILT-IN ANTICOINCIDENCE SHIELDING FOR THE DETERMINATION OF LOW-LEVEL ACTIVITIES. Leistner, M.; Boes, J. (Institut fuer Angewandte Radioaktivitaet, Leipzig). Isotopenpraxis, 2: 55-8(Feb. 1966). (In German).

The limiting values of a counter array are considered, and formulas for the arbitrary limits of reliability of the measurements are derived. When the activities of the samples are low and there is no necessity to distinguish β and α radiation, a 4π flow counter with built-in anticoincidence counters may be operated in the Geiger region with less complexity of the arrangement than is possible in the proportional region. (auth)

46067 X-RAY AND GAMMA-RAY DOSE AND DOSE RATE MEASUREMENTS INDEPENDENT OF ENERGY AND DISTRIBUTION IN A LARGE RANGE BY USING THE DOSIMETER VA-J-18. Kittner, M. W.; Voigtmann, H. (VEB Vakutronik WIB, Dresden). Isotopenpraxis, 2: 89-95(Feb. 1966). (In German).

The design and construction of ionization chambers independent of energy and direction of the radiation are described. The concept and function of the dosimeter VA-J-18, that is suited for measuring the dose and dose rate in clinical and therapeutical applications is also described. The wide range of the instrument makes it suitable for monitoring nuclear-medical and radio-biological experiments, for uses in radiological protection, and for measuring γ-activities. (auth)

46068 DETERMINATION OF THE ^{125}I ACTIVITY. Stephan, H. (Zentralinstitut fuer Kernforschung, Rossendorf, Ger.). Isotopenpraxis, 2: 161-4(Mar. 1966). (In German).

An absolute method of measuring the ^{125}I activity independent of preparation technique, geometry, and absorption is described. The activity may be determined with an accuracy of ±3% by measuring the single counting rates as well as the coincidence one by a commercial NaI(Tl) crystal and a pulse-height analyzer. (auth)

46069 APPLICATION OF IONIZATION CHAMBERS TO THE MEASUREMENT OF HIGH GAS PRESSURES. Vukolov, V. I.; Erdakov, V. B.; Parfenov, N. A.; Shtemberg, S. V. Izmeritel. Tekh., No. 6, 66-8(1966). (In Russian).

Although α-ionization chambers have been used for measuring gas pressures, for various reasons they have been found unsuitable for pressures higher than 20×10^5 newtons/m^2. A method was therefore developed to take advantages of the convenience offered by this device, determining the pressure of gases possessing radioactivity or containing radioactive admixtures. The theoretical system was experimentally tested and found suitable for relatively high pressures. Under certain conditions, depending on the tension of the supply current and the desired pressure range, the ionization current i of the chamber was found to increase with decreasing pressure, according to the correlation $i \approx p^{-\frac{1}{2}}$. The sensitivity of the instrument may be increased by means of a compensating circuit; in order to reduce the errors, the supply current must be stabilized. The method should not be used for measuring the pressure of very pure gases, the composition of which may change during the time of measurement. (TTT)

46070 NEW DESIGN OF SCINTILLATION COUNTER. Lynch, A. F. (Lab. of the Government Chemist, London). Lab. Pract., 14: 1057-8(Sept. 1965).

An apparatus for scintillation counting of radioactive samples is described, in which the design allows easy decontamination and rapid changing of scintillator screens. It can be made in a lab workshop for less than $70, including the cost of a photomultiplier (PM) tube. Difficulties were experienced in this lab with the commercially manufactured α scintillation equipment used, so the design and manufacture of an alternative unit were carried out. Three plates form the basis of the counter and are machined from 9-in. dia blanks of aluminum alloy, ½ in. thick. The baseplate mounts a center pin which forms the bearing upon which the planchet carrier plate revolves. This carrier plate is indexed in any of three positions by means of a simple ball click device and suitably disposed indentations in the underface of the plate. The three positions coincide with the three planchet nacelles in the upper face of the carrier. The PM tube holder, of thick walled duralumin tubing, is shouldered and threaded at its lower end into the carrier plate. So that the scintillator screen is positioned as closely as practicable to the sample face, the scintillator screen is located in a threaded cup at the end of the PM tube. The photomultiplier tube is held down to the scintillator surface by a spring. With this apparatus, a typical specimen of this design shows an α-counting efficiency of about 30% for natural uranium, and a background level of 4–6 counts per hour. Beta particles may be counted by the use of a suitable scintillator material. (BBB)

46071 200-CHANNEL PULSE HEIGHT ANALYZERS TYPE ND-1660. Kurahashi, Koichiro; Ohnishi, Ryoichi (Mitsubishi Electric Mfg. Co., Ltd., Japan). Mitsubishi Denki Giho, 40: 996-1002(June 1966). (In Japanese).

The multi-channel pulse height analyzer (PHA) is used mainly for nuclear physics, radiochemistry and in many other wide fields covering human medical electronics area. Based on the 256-channel PHA already developed, Mitsubishi has brought into its production 400-channel PHA and 200-channel ones. The 400-channel PHA is one designed for high-grade general purpose, the details of which were previously described. The 200 channel PHA is used as a gamma spectrometer for its major service and possesses of the following characteristics: increased reliability by using silicon transistors, compact size, and low price. (auth)

46072 A SIMPLE DEVICE FOR THE SCINTILLATION COUNTING OF AQUEOUS SOLUTIONS OF ^{45}Ca AND OTHER β-EMITTING ISOTOPES. Sansom, B. F.; Taylor, P. J. (Inst. for Research on Animal Diseases, Compton, Newbury, Eng.). Nature, 211: 626(Aug. 6, 1966).

In many applications it would be useful to be able to count ^{45}Ca directly in large volumes of aqueous solutions without quenching corrections, even if at low efficiency. An apparatus designed for this purpose is described. It consists of an array of sixty plastic scintillator filaments, 1 mm × 4 cm, spaced at intervals of 2 mm between centers in a Perspex disk. The disk is fitted to the bottom of a Perspex cylinder, forming a container of volume 8 ml. The "brush" counter is suitable for counting aqueous, dilute acid or dilute alkali solutions of β-emitting isotopes in a liquid scintillation counter with a single photomultiplier. (W.D.M.)

46073 SILICON CARBIDE HIGH-TEMPERATURE NEUTRON DETECTORS FOR REACTOR INSTRUMENTATION. Ferber, R. R.; Hamilton, G. N. (Westinghouse Electric Corp., Pittsburgh). Nucl. Appl., 2: 246-51(June 1966).

Miniature neutron detectors were constructed by positioning a ^{235}U layer above the sensitive surface of a shallow-junction silicon carbide diode to act as a neutron conversion coating. A series of tests were performed to verify the neutron detecting characteristics of ^{235}U-coated SiC detectors operating in a reactor environment. The reactor neutron flux was varied between 10^7 and 10^{11} n/(cm^2 sec) to determine the linearity of response of the detector to changes in reactor power. The potential of the SiC neutron detector as a flux-mapping device was demonstrated by making axial traverses of the reactor core while holding the peak flux level constant at 10^9 n/(cm^2 sec). The α-particle counting capabilities of these SiC diodes have been demonstrated to temperatures above 700°C (≈1300°F) and with integrated neutron fluxes greater than 6×10^{15} n/cm^2. (auth)

46074 LiF THERMOLUMINESCENCE FOR NEUTRON IMAGE STORAGE. Kastner, Jacob; Berger, Harold; Kraska, I. R. (Argonne National Lab., Ill.). Nucl. Appl., 2: 252-3(June 1966).

A thermoluminescent method for displaying thermal-neutron images is described. A sheet of ^6LiF, exposed to the imaging neutrons for periods as long as is necessary to capture the image, can be made to reproduce the image by means of the light emission produced by heating at anytime after the exposure. The excellent storage capability of this detection method makes it attractive for use with relatively low intensity neutron radiographic beams. (auth)

46075 APPLICATION OF PHOTOMULTIPLIER XP 1021 IN FAST SCINTILLATION COUNTERS. Langkau, R.; Ruehl, H.-H. (Institut fuer Experimentalphysik, Hamburg). Nucl. Instrum. Methods, 43: 368-72(Aug. 1966). (In German).

The behavior of an XP 1021 photomultiplier with respect to short light and scintillation pulses was investigated to determine the utility of the photomultiplier in fast scintillation counters. Experiments with a light pulse showed that the focusing clearly affected the total pattern of the pulse. The properties of the electron optical output system for two focusing adjustments were determined. The results showed that minimum transmission time oscillations could be obtained only with considerable reduction of the sensitivity. In conjunction with a plastic scintillator and excitation by γ radiation, output pulses were obtained for various

conditions. A comparison of the pulse rise time obtained with the XP 1021 photomultiplier and those obtained with another commonly used photomultiplier show a much better time resolution with the XP 1021. The pulse rise time agrees within the measurement accuracy with that of the noise pulse. (J.S.R.)

46076 MEASUREMENTS OF THE FREQUENCY RESPONSE OF NEUTRON SENSITIVE CURRENT ION CHAMBERS. Gasiorowski, Leslaw; Labno, Leszek (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 175-84(1966).

In experiments when the neutron sensitive ion chamber must follow fast changes of flux such as in measurements with reactivity oscillator and in reactor noise measurements the frequency response of the chamber can be a significant factor in analysis of results. Measurements of the frequency response of three different type neutron sensitive ion chambers were performed by neutron beam modulation using 100 mm beam hole of the EWA reactor. Obtained frequency response characteristics allowed estimates of the operating range of measured type chambers for kinetic experiments. (auth)

46077 COLLECTION TIME OF SEMICONDUCTOR DETECTORS. Tanguy, J. (CEN, Saclay, France). Onde Elec., 46: 785-94(July-Aug. 1966). (In French).

Charge collection times were calculated for PN and PIN junctions. The rise times obtained for surface barrier detectors were quite different from the theoretical values, especially for heavy particles entering the back side of the detector. This effect will be used for pulse shape discrimination between particles of different mass. (F.S.)

46078 DIRECT RECORDING OF PULSES FROM JUNCTION DETECTORS. Vacher, J. (CEN, Grenoble, France). Onde Elec., 46: 795-800(July-Aug. 1966). (In French).

A device which permits the observation of the current pulses produced in semiconductor detectors by α particles is described. Due to the rapidity of these pulses a sampling oscilloscope must be used. The amplitude of the pulses to be observed is, however, smaller than the noise level of available scopes. To eliminate this noise, a series of circuits is used to restore the mean value of the samples in digital form. These samples are then fed to a multichannel analyzer, used as a multiscaler which reconstructs the shape of the pulse, point by point. (auth)

46079 ON THE USE OF Ge(Li) DETECTORS IN SHORT TIME MEASUREMENTS. Miehe, J. A.; Ostertag, E.; Coche, A. (Centre de Recherches Nucleaires, Strasbourg). Onde Elec., 46: 801-3(July-Aug. 1966). (In French).

Preliminary results of resolving time measurements performed with an experimental arrangement using one Ge(Li) detector in coincidence with one scintillation counter are given. The prompt resolution curve shows a full width at half maximum of 3 ns. (auth)

46080 FAST AMPLIFIER FOR SEMICONDUCTOR DETECTORS WITH VERY HIGH COUNTING RATE CAPABILITY. Bosshard, R. (Faculte des Sciences, Orsay, France). Onde Elec., 46: 804-18(July-Aug. 1966). (In French).

An amplifier is described which is capable of handling very high counting rates without pile up. The amplifier has a 6 ns risetime; pulses can be clipped down to 10 ns. Gain is 300 and noise levels in the range of 30 kev (F.W.H.M. for silicon) are achieved. α particle pulses of 10^8 counts per second due to protons from an electrostatic accelerator have been correctly measured. Operation with pulsed accelerators yields satisfactory background reduction. The structure of the amplifier is given. Pile up problems are discussed both in pulsed and continuous operation. The noise characteristics were studied, taking into account the effect of amplifier and detector risetimes and clipping time. (auth)

46081 RESOLVING TIME OF SEMICONDUCTOR DETECTORS. Balland, J. C.; Goyot, M.; Pigneret, J.; Samueli, J. J. (Institut de Physique Nucleaire, Lyon). Onde Elec., 46: 844-52(July-Aug. 1966). (In French).

The output of a surface barrier detector is theoretically studied taking into account the fast amplifier input impedance. The resolution time is found to be limited only by the electronic system noise. The time response of a Ge(Li) p-i-n detector is computed in the case of gamma ray detection. The pulse rise time and a triggering time (fixed threshold) variations are plotted in particular cases. The theoretical models were checked with the experimental results. The design of sophisticated electronic circuitry permits the achievement of delayed coincidence experiments with a 2 mm width p-i-n junction. A fast, low noise, high input impedance amplifier, and a fast discriminator are described. With such circuits the prompt time spectrum obtained was 1.1 ns (fwhm) with a ^{60}Co source and 2.8 ns (fwhm) with a ^{22}Na source. (auth)

46082 ON A FEW PROBLEMS OF FAST ELECTRONICS CONCERNING TIME OF FLIGHT METHOD. Szabo, I. (CEN, Cadarache, France). Onde Elec., 46: 860-3(July-Aug. 1966). (In French).

The most specific point encountered in the fast neutron time of flight work, with the 5 Mev Van de Graaff is the definition of the measurement starting time. When using the pulsed beam of the accelerator, this time is obtained from ion bursts, by means of a pick up loop, the main characteristic of which is the independence of the magnitude and duration fluctuations of the ion bursts. The associated particle method is also of interest, particularly when using the T(p,n)^{3}He reaction which gives a very large neutron energy range. In this case the difficulty is mainly due to the high background of the fast amplifiers associated with the solid state detector. Minor questions concerning the use and performances of time to pulse height converters, amplifiers, and fast discriminators are briefly related. (auth)

46083 PROMPT RESOLUTION CURVE OBTAINED WITH A SURFACE-BARRIER SEMICONDUCTOR DETECTOR IN A COINCIDENCE EXPERIMENT. Gorodetzky, S.; Merdinger, J. C.; Armbruster, R. (CRN, Strasbourg). Onde Elec., 46: 864-6(July-Aug. 1966). (In French).

The measurement of the prompt resolution curve obtained with a surface-barrier semiconductor detector in an alpha-gamma coincidence experiment using a ^{211}Bi source is reported. (auth)

46084 CLEAR PERSPEX DOSIMETRY. Orton, C. G. (St. Bartholomew's Hospital, London). Phys. Med. Biol., 11: 377-86(1966).

Radiation dosimetry using induced optical changes in clear Perspex was investigated with particular reference to the effect of contaminants. It was found that the changes in optical absorption depended upon the initiator used in polymerization and the concentration of residual monomer. The formulation of a Perspex suitable for dosimetry is discussed. The fading of the induced absorption was also studied and found to depend on the benzoyl peroxide concentration, the dose, and the wavelength at which spectrophotometric measurements are made. If aged in air after exposure, this fading was shown to be dependent upon the diffusion of oxygen into the samples. (auth)

46085 REFERENCE PERSPEX RADIATION DOSEMETER. Berry, R. J. (Churchill Hospital, Oxford); Orton, C. G. Phys. Med. Biol., 11: 475-6(1966).

Optical transmission at 292 mμ by 0.15% or 0.25% benzoyl peroxide samples was investigated, and it was found that 0.15% benzoyl peroxide in 3 mm sheets is preferable to other materials. The calibration curve of optical density change was non-linear when the optical density change was plotted against dose. (H.G.D.)

46086 CONTINUOUS SWELLING MEASUREMENTS DURING THE PROCESSING OF NUCLEAR EMULSIONS. II. RESEARCH ON GELATIN LAYERS AND THEIR APPLICATION TO THE DEVELOPMENT OF NUCLEAR EMULSIONS. Frieser, H.; Heimann, G.; Eger, H.

(Technische Hochschule, Munich). Photogr. Korresp., 100: 143-7(1964). (In German).

Swelling measurements were made on gelatin layers as a function of the salt concentration, layer thickness, pH, and the presence of a 30% thiosulfate solution. The swelling occurring in the stop bath, fixer bath, washing, and drying is described individually for each step. (J.S.R.)

46087 CONTINUOUS SWELLING MEASUREMENTS DURING THE PROCESSING OF NUCLEAR EMULSIONS. III. THE SWELLING OF COMMERCIAL PHOTOGRAPHIC LAYERS IN THE COMMON PROCESSING BATHS. Frieser, H.; Heimann, G.; Eger, H. (Technische Hochschule, Munich). Photogr. Korresp., 100: 177-81(1964). (In German).

Swelling measurements were made on commercial films during processing in common baths. A preliminary study was made of the various parameters affecting swelling. A comparison was made of the swelling processes in various black and white film, all treated alike. The swellings occurring when one film type was treated with different developers were compared. It is shown that the swelling initially produced was still present in the succeeding baths. It was ascribed to a structural change of the gelatin in the first bath. The swelling processes of a color negative film during processing in the common developers were determined. The swelling of a color reversal film during normal processing was also followed and it was found that the intermediate washing after the color development leads to the greatest layer thickness. A characteristic vibrational layer density change during washing after the stop bath can be limited by various hardening conditions in the individual layers of the multilayer film. (tr-auth)

46088 BUBBLE CHAMBERS TODAY AND IN THE NEAREST FUTURE. Bartke, Jerzy (Inst. for Nuclear Research, Krakow). Postepy Fiz., 17: 375-82(1966). (In Polish).

The features of the existing bubble chambers are summarized and recent advances in the bubble chamber technique are discussed. The main points here are: obtaining high magnetic fields in large volumes, and methods of illumination and photography. A review is given of the very large bubble chamber projects which have been put forward in the last years. (auth)

46089 PERFORMANCE OF A LARGE AIR CHERENKOV COUNTER USED TO DISTINGUISH PROTONS AND PIONS IN THE COSMIC RADIATION UPTO AN ENERGY OF 45 Gev. Subramanian, A.; Verma, S. D. (Tata Inst. of Fundamental Research, Bombay). Proc. Indian Acad. Sci., Sect. A, 64: 13-20(July 1966).

A description is given of a large air Cherenkov counter (area = 0.25 m^2 and solid angle = 0.125 steradian) used in an experiment to distinguish protons and pions in the cosmic radiation. A measurement of the efficiency of the counter indicates that, in the energy region of about 10 to 45 Bev, the counter can discriminate pions from protons with an efficiency of about 85%. The limitations which are involved in pushing the threshold velocity of the counter to higher values are briefly discussed. (auth)

46090 AN ANALYSIS OF SUCCESSIVE DIFFERENCES USED IN MULTIPLE SCATTERING MEASUREMENTS ON THE BASIS OF DISTORTION OBSERVED IN NUCLEAR EMULSIONS. Aditya, Prem K. (Indian Inst. of Tech., New Delhi). Sci. Ind. Photogr., 37: 1-6(1966)

An analysis of successive differences of coordinate readings taken for multiple scattering measurements was made in terms of the distortion observed in nuclear emulsions. It has been shown that there is a strong correlation between the ratio of successive differences and the characteristics of distortion contours. (auth)

46091 PHYSICAL BASIS OF DOSIMETRY. Harder, Dietrich (Univ., Wuerzburg, Ger.). Strahlentherapie, Sonderbaende, 62: 254-79(1966). (In German).

A clear relation of dosimetry to other radiation physics was made in the last 12 years because of the international introduction of the energy dose. The solution of the physical problems connected with the threshold value definition of the energy dose was accomplished. The principal part of the work was made by the probe method of dosimetry. A component analysis of the energy delivery facilitates the survey of the dosimetric principles and the delta particle problem, whose practical solution consists in the formulation of the delta-particle equation. The measurement of particle spectra, together with other physical basic problems of dosimetry needing additional study, were cited. (tr-auth)

46092 NUERNBERG WHOLE-BODY COUNTER. Balz, Guenter (Staedtische Krankenanstalten, Nuernberg). Strahlentherapie, Sonderbaende, 62: 293-8(1966). (In German).

The design and construction of the Nuernberg whole-body counter is briefly described. Background spectra and typical spectra from patients are given. (J.S.R.)

46093 BORON-CONTAINING THERMAL NEUTRON DETECTORS. Panidi, I. S.; Paushkin, Ya. M.; Voronina, M. A. Tr. Mosk. Inst. Neftekhimi Gaz. Prom., No. 51, 84-7(1964). (In Russian).

Efficiencies of 16% were achieved with special preparations of boric acid in ethylene glycol with zinc sulfate additions. Boron contents for the preparations ranged from 20 to 24%. Optimum surface densities were 90 to 100 mg/cm^2. (TSS)

46094 POSSIBILITY OF USING CADMIUM TELLURIDE FOR MAKING n-p GAMMA DETECTORS. Arkadeva, E. N.; Matveev, O. A.; Rud, Yu. V.; Ryvkin, S. M. (Ioffe Inst. of Physics and Tech., Leningrad). Zh. Tekh. Fiz., 36: 1146-8(June 1966). (In Russian).

Tests were made to investigate the possibility of recording γ quanta with the aid of n-p transitions based on cadmium telluride. To construct a highly efficient semiconductor n-p counter for operation in a suitable temperature range, a material with a high atomic number and a sufficiently wide forbidden band should be used. The specimens were therefore prepared from CdTe crystals with n-type conductivity by means of lithium diffusion. A sensitive layer approximately 200 μ thick was obtained as a result of the drift of Li^+ ions in the n-p transition field. The mobility of the Li^+ ions in CdTe was determined to be approximately 5×10^{-10} $cm^2/v \cdot sec$, i.e., it was sufficiently high. The reverse current of such a structure was approximately 10^{-8} amp. The relatively weak dependence of capacity on voltage at high voltages shows that the transition is structurally similar to the n-i-p system. The working surface of the specimens was 5 to 7 mm^2. With such specimens a positive count of ^{137}Cs γ-quanta and β particles at room temperature with a signal-to-noise ratio of approximately 15 to 20 was obtained. (ATD)

46095 IMPROVEMENTS IN OR RELATING TO RADIATION INDICATORS. Vale, Raymond Lester; Farrell, John Joseph (to United Kingdom Atomic Energy Authority). British Patent 1,040,704. Sept. 1, 1966. Filed Apr. 6, 1963.

A radiation-sensitive printing ink comprising a solution of an organic solvent of an acid sensitive dye and a polymer containing vinylidene chloride is described. Upon exposure to 2.5 mrads of γ radiation the color of the dye changes. Color changes can also be caused by exposure to light in the uv region. (R.C.K.)

46096 INTEGRATING ALPHA COUNTER. Ludlum, Donald George (to Eberline Instrument Corp.). British Patent 1,039,072. Aug. 17, 1966. Filed Feb. 9, 1965.

An integrating α counter comprising a gas-flow probe and an electrical circuit used to monitor personnel for α contamination is described. The circuit includes a trigger that receives the probe signal converting it to pulses of equal magnitude, a meter which reads proportionally to the number of pulses, a timing circuit that indicates when more counting time is needed and resets the equipment after counting, and an alarm circuit that indicates too much contamination. (F.S.)

Radiation Effects

46097 (AD-630344) RADIATION EFFECTS ON INSULATED GATE FIELD EFFECT (MOS) INTEGRATED CIRCUITS. Quarterly Technical Report No. 1, July 1-September 30, 1965. Long, David M.; Flescher, Harold L.; Harrison, Stanley E. (Martin Co., Baltimore, Md.). Apr. 1966. Contract DA-28-043-AMC-01520(E). 61p. (ECOM-01420-1). CFSTI $6.60 cy, $0.75 mn.

The preliminary theoretical analysis of permanent radiation effects on MOS devices indicates that after 10^{14} n/cm^2 the average carrier mobility in the channel decreases about 5%, the reverse leakage current of the drain-substrate p-n junction (I_{pnc}) increases by a factor of 10 to 100, the terminal capacitances (C_{gs}, C_{gd}, and C_{ds}) are not significantly changed except for the bias dependence of the channel capacitance which is influenced by shifts in threshold voltage (V_T), and the drain current transconductance, and channel conductance are significantly influenced by the variations in V_T. The predicted changes in V_T due to bulk damage in the substrate are too small to account for the V_T changes observed experimentally by several workers in the field. The changes in V_T are apparently caused by a redistribution of charge in the oxide, but the exact damage mechanism has not been established at this time. The analysis of transient effects revealed that the dominant response mechanisms are charge scattering from the device leads; leakage resistance as dictated by ionization of the gas inside the encapsulated device; transient gate current resulting from the generation of carriers in the transverse electric field of the channel; and transient drain current resulting from the primary photocurrent of the drain p-n junction. (TAB)

46098 TRANSIENT RADIATION EFFECTS IN ELECTRONICS. Conrad, Edward E. (Harry Diamond Labs., Washington, D. C.). Advances Nucl. Sci. Technol., 3: 143-203(1966).

A survey was made of the more salient features of transient radiation effects on electronics. The general areas of interest dealt with gamma radiation, electrons, neutrons, secondary electrons, and charge recombination mechanisms. Typical component data are discussed for resistors, capacitors, cables, semiconductor devices, vacuum tubes, and gas tubes. (M.O.W.)

46099 EFFECTS OF NEUTRON IRRADIATION ON SOLID-STATE DETECTORS. Cantarell, I.; Facetti, J. F.; Trabal, E.; Vega, R. (Centro Nuclear de Puerto Rico, Mayaguez). pp 45-6 of I Conferencia de Espectroscopia Nuclear y Fisica del Estado Solido. Lima, Organizacion de Universidade Catolicas de America Latina, 1964. (In Spanish).

Solid-state detectors exposed to reactor neutrons showed a progressive decrease of the resolution in the first two days of irradiation, and false tracks appeared in the lower zone of the spectrum. The detector showed other pronounced variations after a month of irradiation and did not recover during a month of rest. There was an almost complete loss of resolution and a large number of false tracks which deform the spectrum. γ spectra made of the detector and its components showed the presence of Cu and Co isotopes in the accessory components of the detector. The initial variation of resolution seems to be caused by the activation of the detector. (J.S.R.)

46100 NUCLEAR IRRADIATION EFFECT ON SWITCHING TIME OF FAST DIODES. Bielle, J.; Cambou, F. (Faculte des Sciences, Toulouse). Onde Elec., 46: 857-9(July-Aug. 1966). (In French).

Fast switching diodes (1N 914 and 1N 916) have been irradiated by nuclear particles so as to improve the switching speed. An integrated dose of 10^{15} fast neutrons per cm^2 reduces the storage time by a factor 2.2 to 3.7. After irradiation, the number of defects is reduced by a factor two by annealing several hours at 150°C. On the other hand, this effect appears to give increased stability at the running temperatures of these diodes. (auth)

46101 RESPONSE OF LOW-POWER NUVISTORS TO PULSED NUCLEAR RADIATION. Stacy, I. F.; Feyder, F. J. (RCA Electronic Components and Devices Div., Sommerville, N. J.). Contract DA-49-186-AMC-89(D). RCA Rev., 27: 408-24(Sept. 1966).

Results of the exposure of operating nuvistors to the gamma-neutron fields of the pulsed TRIGA Mark F reactor are discussed. Three nuvistor types and a conventional miniature tube type were operated statistically and dynamically (at 1,000 cps). Grid and plate currents were recorded before, during, and after the reactor transients. The tests showed that there were no permanent effects on the tubes. During the pulses, an electron current flowing through the grid resistor to the grid caused a decrease in bias and a corresponding increase in plate current. During dynamic operation and with the signal-input coupling capacitor in the circuit, the plate-current recovery time could be made as small as desired. During static operation the plate-current shift followed the reactor transient. As distance from the reactor shroud was increased, the current induced in the grid circuit by the transient corresponded more closely to the fall-off in the peak gamma exposure rate than to the peak neutron flux rate. The results of the tests were consistent with the theory of Compton ejection of electrons from the tube grid. The data indicated that the magnitude of the effect on a tube cannot be correlated with the grid weight or surface area alone, but must include the overall tube structure and potential distribution. (auth)

ISOTOPE TECHNOLOGY

General

Refer also to abstract 45884.

46102 (ORNL-4013) REVIEW OF RADIOISOTOPES PROGRAM, 1965. Gillette, J. H. (Oak Ridge National Lab., Tenn.). Sept. 1966. Contract W-7405-eng-26. 34p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A review of the accomplishments of the Radioisotope Applied Research Program at ORNL during 1965 is presented. Radioisotope separations and purification, source development, source safety testing, isotope production and sales, and the dissemination of technical information on isotopes and radiation technology are discussed. (R.C.K.)

Industrial Applications

Refer also to abstracts 45347, 45416, 45705, and 45842.

46103 (AECL-Pak-RB/3) STERILIZATION OF SURGICAL CATGUTS BY THE APPLICATION OF GAMMA RADIATION. Period Covered: February-August 1965. Majid, Abdul; Mohyuddin, Mirza; Hamid, Muhammad Abdul (Atomic Energy Centre, Lahore (Pakistan). Radiobiology Div.). 12p. Dep. mn.

The sterilization dose of locally manufactured catguts has been found to be 2.5 megarads. A dose of 2.5 megarads has also been internationally recognized as their sterilization dose. The studies on the change in tensile strength and period of absorption in animal tissue showed that radiation of catguts with the sterilization dose of 2.5 megarads caused no change in these respects. It was concluded that sterilization of locally-manufactured catguts could easily be carried out with a dose of 2.5 megarads of γ radiation instead of the present conventional method of autoclaving, without any change in tensile strength and period of absorption of such sterilized catguts in animal tissues. (auth)

46104 (AECL-Pak-RB/10) REPORT ON THE STERILIZATION OF SURGICAL COTTON AND GAUZES BY GAMMA IRRADIATION. Period Covered: February-July 1966. Mohyuddin, Mirza; Majid, Abdul; Chaudhry, Mukhtar Ahmad (Atomic Energy Centre, Lahore (Pakistan). Radiobiology Div.). 13p. Dep. mn.

Surgical cotton and gauzes were found to be highly contaminated with different types of bacteria. Autoclaving at high temperatures for sterilization deprives cotton of its absorption properties. Gamma radiation from ^{60}Co was found to effectively sterilize surgical cotton and gauzes at a dose of 2 Mrads without any change in their properties of surgical importance. (auth)

46105 (BM-RI-6855) RADIOACTIVE TECHNIQUES FOR CONTINUOUSLY MEASURING FLOTATION FROTH DENSITY AND PULP FLOW RATES. Batty, J. V.; Gibbs, H. L.; Poston, A. M. Jr. (Bureau of Mines, Washington, D. C.). 1966. 18p. Bureau of Mines Free.

Techniques involving the use of beta- and gamma-ray-emitting radioisotopes and their successful adaptation to the density of mineralized flotation froths, the rate of flow of finely ground ore pulps, and the residence time of pulps in processing circuits are described. Specifically, the water and mineral loads of flotation froths were continuously measured by determining the proportion of a constant-strength beam of beta rays that was absorbed by the froth column. Continuous measurement of the rate of flow of an ore pulp was accomplished by measuring the changing width of a free-falling stream of the pulp with a collimated beam of beta rays. The residence time of solids in conditioning and resin-in-pulp circuits was accurately measured by following the progress through these circuits of a portion of the pulp that had been tagged with the gamma-emitting ^{110}Ag radioisotope. (auth)

46106 NUCLEAR METHODS OF ANALYSIS FOR LUNAR AND PLANETARY EXPLORATION. Wilkniss, P. E. (Naval Propellant Plant, Indian Head, Md.). Atompraxis, 12: 391-2(Aug. 1966).

Some nuclear methods applicable to planetary exploration are reviewed. Lunar and planetary compositional studies can be performed by evaluating particle dispersion, neutron interactions, or gamma spectrometry. The following uses are made of radionuclides; detection of life on Mars with carbon-14; determination of oxygen or argon on Mars with krypton-85 and iron-55 and planetary composition studies using helium-3 as an x-ray source. (F.S.)

46107 IRRADIATION OF FOOD. Brit. Med. J., 2: 188(July 23, 1966).

On 4 July 1966, the U.K. Minister of Health announced that the Report of the Working Party on Irradiation of Food had been accepted. Regulations will now be introduced under the Food and Drugs Act to prohibit the irradiation of food and food products intended for human consumption, and the sale in the U.K. of food which has been irradiated. However, this legislation will in fact result in the setting up of machinery for obtaining official approval for specific processes. A scrutinizing body will be established to advise on applications for exemptions from the prohibition. The equivalent of a permitted list might appear, as is the case with certain classes of food additives. Another approach to legislation is to invoke existing regulations such as those governing food additives, with or without explicit mention of irradiated foods or definition of food irradiation as a food additive. Food irradiation is dealt with as a food additive in the U. S., where wheat, potatoes, and bacon have already been cleared by the Food and Drug Administration, although no fully commercial processes are yet operating. However, a pilot plant for the disinfestation of grain by irradiation has been completed there, and another in Turkey. International organizations are studying legislative procedures in different countries so as to give guidance on international trade in irradiated products. In the meantime, research into various aspects of food irradiation will continue in Great Britain, with particular interest in processes aimed at extending the refrigeration life of meat and fish and at the elimination of salmonellae from certain imported foods. (BBB)

46108 IRRADIATION OF GULF COAST AREA STRAWBERRIES. Lovell, Richard T.; Flick, George J. (Louisiana State Univ., Baton Rouge). Food Technol., 20: 99-102 (July 1966).

The effects of low levels of ^{60}Co radiation on organoleptic, chemical, and textural properties, and on the keeping quality of Dabreak strawberries, were examined. Preliminary studies had shown that Dabreak was the most adaptable of the strawberry varieties produced in the Gulf Coast area for radiation preservation. Collections of this variety of strawberries were harvested at four different stages of the 1964 season and irradiated at dose levels of 0, 150, 250, and 350 krad. Strawberries irradiated with 150 krad softened slightly, and firmness was reduced more severely in the 250- and 350-krad fruit. Organoleptic tests showed the irradiated samples to be sweeter than the controls, and the 150-krad samples to have a more desirable flavor than the other irradiated or the control fruit. Irradiation caused no change in reducing or nonreducing sugars, no marked color alteration, but a significant decrease in titratable acidity. After 12 days of storage, tissue firmness increased in the irradiated and unirradiated fruit. The keeping quality of Dabreak strawberries was improved through a reduction of fungus growth by irradiation at 150 krad. The higher doses caused development of soft spots on the fruit during storage. It appears that 150 is superior to 250 or 350 krad for irradiating Dabreak strawberries. (BBB)

46109 EXPERIMENTAL STUDIES OF THE DYNAMIC BEHAVIOUR OF ISOTOPE RELAYS. Donath, G.; Sahner, G. (Hochschule fuer Verkehrswesen Friedrich List, Lehrstuhl fuer Hochfrequenztechnik, Dresden. VEB Vakutronik WIB, Dresden). Isotopenpraxis, 2: 32-6(Jan. 1966). (In German).

Experimental studies on isotope relays to verify the applicability of the foundations for calculating the parameters of isotope relays are reported. The results obtained from statistical measurements by means of a mock-up are evaluated and compared with measurements under real conditions, especially for using the isotope relays in train control and train end announcement, and the computing method developed by G. Sahner. Good agreement was obtained. The results show a way for dimensioning an isotopic relay in dynamic operation. (auth)

46110 EXTENSION OF THE RANGE OF WALL THICKNESS DIFFERENCES EVALUABLE IN GAMMA-RAY FILM RECORDING. PART I. THE FILMS METHODS. Freyer, G.; Becker, E.; Vorsprach, F. (Institut fuer Werkstoffkunde und Werkstoffpruefung der TH, Magdeburg, Ger.). Isotopenpraxis, 2: 37-42(Jan. 1966). (In German).

The differences of wall thickness that can be evaluated on a film depend on the specimen and the film type, on the conditions of photographical development, and on the energy of the source used. The film methods hitherto used for expanding the range of these differences (single-film method, multifilm method) show some disadvantages in both economic and qualitative relation. These disadvantages may be avoided by the two-film method. It is based on using two films with different sensitivity, which are exposed simultaneously. The ranges of thickness to be evaluated are in an optimum range of density in each of the films, and the flaws are well detectable. (auth)

46111 THE DEVELOPMENT OF THE INSTITUTE OF APPLICATION OF RADIOACTIVE ISOTOPES, 1955 to 1965. Herforth, L. Isotopenpraxis, 2: 126-30(Mar. 1966). (In German).

A brief description of the development of the Institute of Radioactive Isotopes Application is given. A bibliography containing 199 references to information on applications of radioisotopes is included. (F.S.)

46112 A UNIT FOR LEAK-TESTING OF SEALED TRANSISTORS ON THE BASE OF ^{85}Kr. Schaefer, H.; Koban, G.; Goly, M. (Institut fuer Angewandte Isotopenforschung, Berlin. VEB Hochvakuum, Dresden). Isotopenpraxis, 2: 147-51(Mar. 1966). (In German).

A unit for leak-testing sealed transistors has been developed and constructed using ^{85}Kr as a tracer. The unit is equipped with a charcoal pump. The maximum pressure is 13 kg/cm^2 and the maximum total activity 40 Ci of ^{85}Kr. Theoretical aspects of the structure and the function of the testing unit are described. The results of the ^{85}Kr method are compared with those of other methods. (auth)

46113 HOME ISOTOPIC DEVICES FOR THE USES IN INDUSTRIAL MEASURING TECHNIQUES. I. Schurz, E. (Institut fuer Anwendung Radioaktiver Isotope, Dresden). Isotopenpraxis, 2: 164-78(Apr. 1966). (In German).

Isotopic devices for measurements in industrial practice have been developed and economically utilized for about 10 years. Gamma relays, thickness gauges and density meters as well as humidity measuring devices and devices for analyzing chemical substances and determining their concentration have reached a technological state and a range of variation that they may essentially expand the conventional possibilities of measuring techniques in the industrial field. (auth)

46114 HOME ISOTOPIC DEVICES FOR THE USES IN INDUSTRIAL MEASURING TECHNIQUES. II. Schurz, E. (Institut fur Anwendung Radioaktiver Isotope, Dresden). Isotopenpraxis, 2: 215-20(June 1966). (In German).

The performance of isotopic equipment used in industry in Germany is discussed. Gamma relays and thickness, density, and humidity gages are described. (F.S.)

46115 APPLICATIONS OF RADIONUCLIDES IN ELECTRO-ENGINEERING. Loeffler, H. (Institut fuer Anwendung Radioaktiver Isotope, Dresden). Isotopenpraxis, 2: 245-50(June 1966). (In German).

The application of radionuclides in electro-engineering was surveyed. Radionuclides are used for wear measurement, investigation of technological processes, especially in manufacturing electrotechnical products, trace analysis in semiconductors, direct generation of electric energy, and in investigating electrophysical and electrochemical properties. Industrial uses of radionuclides in measurement techniques such as radiometric leak testing, elimination of electrostatic charges, γ-ray material testing, thickness gaging, moisture measurements, and radioactive relays are discussed. (127 references) (F.S.)

46116 RADIOMETRIC METHODS FOR DETERMINING THE EFFECT OF CORROSION INHIBITORS IN PETROLEUM PROCESSING. Russow, R.; Becker, F.-J. Isotopenpraxis, 2: 258-62(June 1966). (In German).

Corrosion inhibitors are of interest in avoiding material damage in petroleum processing plants. The principal conventional techniques of determining the effects of those inhibitors are discussed. These techniques, however, are not sufficiently sensitive when low concentrations of hydrochloric acid are applied as in petroleum processing. Therefore, a radiometric technique was necessary to determine these effects with sufficient accuracy under the conditions mentioned. The error of measurement calculated from the maximum absolute deviation from the means amounts to ±3%. The interval for carrying out one measurement is 70 min. The special evaluation necessary for the new technique is discussed. (auth)

46117 BETA-RAY ABSORPTION MEASUREMENTS IN TEXTILE FABRICS. Haase, J. Isotopenpraxis, 2: 287-91(July 1966). (In German).

The special conditions of measuring β-ray absorption in textile fabrics are discussed. The fiber materials such as cotton, viscose, wool, polyamide, and polyester, and polyacrylonitrile almost show the same absorption power, polyvinyl chloride show an aberration of about +15% due to its higher mean atomic number. Moreover, absorption is influenced by the structure of the textiles. This effect increases in the following order: felts, woven fabrics, warp-knitted fabrics (±1 to 2%), knitted fabrics (±4 to 5%). Finally, some practical uses of thickness gages in textile industry are discussed. (auth)

46118 SENSITIZATION OF MICROORGANISMS TO RADIATION BY PREVIOUS ULTRASONIC TREATMENT. Dharkar, S. D. (Atomic Energy Establishment, Trombay, India). J. Food Sci., 29: 641-3(1964).

The effects of ultrasonic treatment on sensitivity to ^{60}Co γ radiation was demonstrated in Micrococcus radiodurans (radioresistant) and Streptococcus faecalis (radiosensitive). It is suggested that the marked effect of ultrasonic treatment may have a practical application in the radiation processing of liquid foods such as fruit juices and milk. (C.H.)

46119 THE TREATMENT OF MEATS WITH IONIZING RADIATIONS. XIII. PASTEURIZATION OF BEEF AND LAMB. Rhodes, D. N.; Shepherd, H. J. (Meat Research Inst., Cambridge, Eng.). J. Sci. Food Agr., 17: 287-97 (July 1966).

The maximum dose of γ radiation that can be applied to beef or lamb at 32°F in the absence of air, without causing changes in organoleptic qualities detectable by a trained taste panel, was found to be 0.4 Mrad. The effect of this dose on the microbial flora and the storage stability of beef in joints, and lamb in joints and halves, was investigated. The results are discussed in relation to the possibility of transporting meat from overseas and the preservation of prepacked meats for retail distribution. (auth)

46120 RADIOCHEMICAL MODIFICATION OF TEXTILE FIBERS. Guetlbauer, F.; Proksch, E.; Bildstein, H. (Institut fuer Chemie des Reaktorzentrums, Seibersdorf, Austria). Oesterr. Chem.-Zeit., 67: 39-41(1966). (In German).

The modification of textile fibers by cross polymerization by ionizing radiation or by radiochemical transfer polymerization is discussed briefly. Methods of transfer polymerization include the simultaneous procedure, intermittent procedure, radicle method, and the peroxide method. The dye affinity of various transfer polymers is discussed. Electrical surface resistance, water uptake capacity, hydrophobic behavior, weathering characteristics, resistance to microorganisms, strength, creasing resistance, heat resistance, adhesive strength, and melting points of various plastics are discussed. Types of radiation required, technical installations needed, and costs of production of plastics produced by irradiation are summarized. (81 references). (BBB)

46121 MECHANISM OF ACTION OF IRRADIATIONS AND OF ANTISEPTIC SUBSTANCES ON BACTERIA AND OTHER MICRO-ORGANISMS. Guillot, M. (Faculte de Pharmacie, Paris). Pharm. Weekbl., 100: 289-305 (1965). (In French).

Bases for the action of ionizing and nonionizing radiations and chemical agents of micro-organisms are reviewed, from the viewpoint of sterilization of pharmacologic products. The concept of the absorption of a quantum of energy in the destruction of a bacterial cell is examined, and of the threshold dose for a specific organism. The nature of the intracellular target, presumably a nucleic acid, is discussed. Reasons are sought for the marked variations in radiosensitivity of micro-organisms, for example the sensitivity of Escherichia coli to 5600 R of x rays compared with 30,000 R in yeasts. The primary reactions, mainly involving radiolysis of water, resulting from ionizing irradiation are outlined and possible mechanisms of secondary reactions of these radicals with macromolecules are discussed. Use of various stabilizing agents in pharmaceutical preparations submitted to radiosterilization is also considered. (BBB)

46122 DEVELOPMENTS IN RADIATION PROCESSING. Shapiro, Zalman M. (Nuclear Materials and Equipment Corp., Apollo, Pa.). pp 235-9 of Proceedings of the 1965 Conference, Atomic Industrial Forum, Inc., Washington, D. C. McCluskey, Robert J. (ed.). New York, Atomic Industrial Forum, 1966.

Industrial uses of radiation, especially in food processing, are discussed. The purpose, radiation source, capacity, and cost for some irradiation facilities are presented. The construction of several flexible pilot plant commercial irradiation facilities in important food production and processing centers is proposed. (M.C.G.)

46123 ISSUING OF REGULATIONS ON THE CLEARANCE OF IRRADIATED FOOD PRODUCTS ON THE BASIS OF FOREIGN PETITIONS. Foa, E.; Eisenberg, E.; Kahan, R. S.; Lapidot, M. (Soreq Nuclear Research Center, Yavne, Israel). Vienna, International Atomic Energy Agency, 1966, Preprint SM-73/50, 7p. (CONF-660609-11). ORAU.

From International Symposium on Food Irradiation, Karlsruhe, Ger.

The supervision and control of irradiation, the distribution of the irradiated food products and the applications of relevant laws or their enactment when none exist are considered. Most legislation now requires that the wholesomeness of irradiated food be proven unequivocably before irradiation and consumption of the food are authorized. As a test case, a petition was submitted on 24 February 1966 to the Israel Ministry of Health for permission to use for human consumption white potatoes that were irradiated in order to prevent sprouting. The petition was based on local work but on that published abroad, with the request that the wholesomeness tests approved by other Governments be accepted as sufficient proof. Another similar petition on the use of irradiated onions will be submitted. If successful, this procedure could be adapted by other countries and might facilitate international trade agreements. It should be instrumental in the rapid development of the application of irradiation for food preservation in places where it could prove of useful economical value. (auth)

46124 ^{60}Co FACILITY AT THE REACTOR CENTER SEIBERSDORF. Weidinger, N.; Kaindl, K. (Reactor Center, Seibersdorf, Austria). Vienna, International Atomic Energy Agency, 1966, Preprint SM-73/42, 12p. (CONF-660609-15). ORAU.

From International Symposium on Food Irradiation, Karlsruhe, Ger.

A plant for research purposes on the International Fruit Juice Programme consisting of two irradiation chambers with a capacity of 30 and 10 kC, respectively, is now under construction. The first one is proposed to irradiate quantities of fruit juice for feeding tests and for investigations in source technology; the other was designed for research purposes in microbiology and chemistry and has an optimal versatility in source configuration and position according to the experiment conditions. The biological shield, ordinary concrete with a density of about 2.4 t/m^3, gives an outside dose rate of 0.2 mR/hr max. The rest position of both sources is a lead cylinder in the shielding concrete. The ^{60}Co rods of the 30 kC facility, each with an outside length of 300 mm, consist of two linked parts, and the rods are fitted into stainless steel tubes, which pass in a spheric gangway into the irradiation chamber. They may be arranged individually or in any combination within about 5 sec by an air pressure system. The chamber with an inside size of 3 × 3 × 3 m may be closed by a concrete door; a binocular periscope enables the scientist to observe the experiment during irradiation. Practically every arrangement of source geometry is possible. The other facility, of about the same size, can be entered through a labyrinth and has six rods, 250-mm long, that may be individually moved by a Teleflex cable. They can be stopped in any position desired, measured from the entrance into the chamber. A monocular periscope is provided for observing the room in which the temperature is controlled between −18 and +35°C ±1°C. Several tubes up to a diameter of 300 mm pass through the concrete shield to allow the installation of cables and tubes for experiments. The irradiation time can be set by means of a separate timer or source positioning can be performed manually. The entire plant is automatically controlled and supervised by an interlock system. A system of radiation detectors and mechanical locks secures optimal safety of the plant against accidents. All important aggregates are supplied by a buffered battery, so that even in case of a voltage breakdown an undisturbed operation is possible. An alarm system and a device for returning the sources to the rest positions in case of accident are provided. (auth)

46125 ENERGY DISTRIBUTION IN ROTATING FRUIT UNDER UNIDIRECTIONAL ELECTRON IRRADIATION. Chadwick, K. H. (EURATOM, Wageningen, Netherlands). Vienna, International Atomic Energy Agency, 1966, Preprint SM-73/70, 12p. (CONF-660609-4). ORAU.

From International Symposium on Food Irradiation, Karlsruhe, Ger.

The problem of dose uniformity in the surface treatment of fruit and other foodstuffs with electrons is considered, with emphasis on the effect of rotation on the energy distribution in the fruit. Integral energy distribution along any radial section does not allow a normal Bragg curve, when rotation is complete. The main effect of rotation is to move the point of peak intensity nearer to the surface of the fruit. A method is described for measuring the energy distribution in rotating fruit by using lithium fluoride crystals mixed in teflon tape. Reproducibility of the method was found to be within 8%. Energy distributions measured in rotating and stationary oranges are compared. Calculations of the rotational effect on the measured stationary distribution for a radius of 3.15 cm was in good agreement with the measured distribution. (H.G.D.)

46126 IMPROVEMENTS IN OR RELATING TO THE TREATMENT OF TEXTILE MATERIALS. British Patent 1,039,410. Aug. 17, 1966. Priority date Mar. 13, 1964, Switzerland.

A process to improve irradiated cellulosic textile materials such as viscose rayon or cotton imitation poplin

by removing stored or residual energy is described. The irradiated textile is treated with an alkaline solution of either sodium or potassium hydroxide at temperatures between 50 and 100°C. The solution must be more alkaline than the solution used in mercerization. The treatment is used at any stage in textile finishing either before or after mercerization. (F.S.)

Power Application

See also ENGINEERING — Space Propulsion

Refer also to abstract 45830.

46127 (DP–1033) PRODUCTION OF ^{204}Tl FROM THALLIUM OXIDE. Cornman, Wilmer R. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). June 1966. Contract AT(07-2)-1. 10p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A sample of natural Tl_2O_3 was irradiated. The specific activity and power density of the irradiation product were in good agreement with the predicted values. A specific power value of 0.00164 watt/curie of ^{204}Tl was obtained from radiometric and calorimetric measurements. (auth)

46128 RADIONUCLIDE PROPULSION DEVICE. Bouquet, Francis L. Jr.; Smyth, Samuel J. (to Lockheed Aircraft Corp.). U. S. Patent 3,258,911. July 5, 1966. Filed June 24, 1963.

A radionuclide propulsion device is described which may be used for aircraft, marine or land vehicles. When not in use for propulsion, a heat disposal engine is provided which may be used as an auxiliary power source. The system consists of a gamma heat source, a waste container, a heat sensitive seal between the heat source and the waste container to prevent a runaway condition in the source, a source of liquid heat sink material coupled to the waste container to cool the heat source, chelating material coupled to the waste container for reducing biological toxicity, and a valve, actuated by the heat seal. The valve is between the chelating source and the heat sink. (F.S.)

Separation and Production

See also CHEMISTRY — Separation Processes and Procedures

46129 (NP-tr–1422) OPTIMISATION OF THE WORKING PARAMETERS FOR ELECTROMAGNETIC ISOTOPE SEPARATORS. Timpl, F.; Winkler, R. H.; (and others). Translated by R. R. Inston (Atomic Energy Research Establishment, Harwell, Eng.), from Abhandl. Deut. Akad. Wiss. Berlin, Kl. Chem., Geol., Biol., No. 7, 285-90(1964). 12p. Dep. mn. JCL $1.60 fs, $0.80 mf.

In an electromagnetic isotope separator, the individual parameters that determine the machine's performance interact with each other. The purpose of optimizing the machine is to determine those working values at which the significant characteristic quantities, such as the enrichment factor and the amount of material collected per unit time, reach their optimum values. In order to do this, the performance of the machine was studied as a function of different working parameters. It was found that there are several correlated pairs of values, for example, the source-oven and cathode heating, at which relative maxima of the collector current are obtained. However, an absolute maximum is obtained only with a quite specific group of values of the different parameters. It is this group of working values alone which can be regarded as the optimum of an economical separator operation. (P.C.H.)

46130 (NP-tr–1423) EVALUATION OF ISOTOPE ANALYTICAL RESULTS FOR ESTIMATION OF THE METHOD OF WORKING AND QUALITY OF AN ELECTROMAGNETIC ISOTOPE SEPARATOR. Timpl, F. Translated by R. R. Inston (Atomic Energy Research Establishment, Harwell, Eng.), from Abhandl. Deut. Akad. Wiss. Berlin, Kl. Chem., Geol., Biol., No. 7, 291-9(1964). 17p. Dep. mn. JCL $1.60 fs, $0.80 mf.

By means of suitable normalization and levelling of the results obtained from mass spectrometric isotope analysis of materials collected during a separation run with electromagnetic isotope separators, a representation of the distribution of the beam over the collector pockets is obtained which is remarkably informative. It is possible to obtain indications not only of those reasons for the occurrence of isotopic contaminations which are imposed by the machine, and hence of the possible improvement of the machine, but also of the reasons for such contaminations which are imposed by the mode of operation. Simultaneously, from the analysis of the outer pockets the local distribution of the beams over all the pockets can be deduced. From this, a relatively reliable conclusion can be drawn as to the enrichment factor and also the isotopic composition of the other pocket materials, without it being necessary to analyze them mass spectrometrically. This is not only advantageous from the point of view of saving work, but is also of economic importance, particularly in the case of rare isotopes and costly charge materials. (auth)

46131 PRODUCTION OF MEASURABLE QUANTITIES OF ISOTOPES BY ELECTROMAGNETIC SEPARATION. Trahin, M. Bull. Inform. Sci. Tech. (Paris), No. 103, 77-87(Apr. 1966). (In French).

The principles which have led to the development of two electromagnetic isotope separators operating with magnetic prisms are presented. The separators produce a homogeneous field which is locally perturbed in order to correct for optical aberrations and an inhomogeneous field having an index of 0.5 which ensures simultaneously the focusing along the radius and on the symmetry axis which is perpendicular to it. The experimental results obtained using sources capable of emitting beams of about 150 mA at 35 kev were compared. (auth)

46132 ISOTOPE SEPARATION BY COUNTERCURRENT ELECTROMIGRATION. Menes, F.; Dirian, G. Bull. Inform. Sci. Tech. (Paris), No. 103, 89-97(Apr. 1966). (In French).

The countercurrent electromigration method, either in solutions or in fused salts, is described. Applications to the separation of very similar species, like isotopes are discussed. Use of the method for studying the structure of fused salts is reviewed. (auth)

46133 PRODUCTION UNIT FOR 3-FOLD ENRICHMENT OF ^{124}Xe IN XENON BY THERMAL DIFFUSION. Molinari, P.; Taniel, G. Bull. Inform. Sci. Tech. (Paris), No. 103, 99-108(Apr. 1966). (In French).

An installation capable of producing 100 g/year of xenon enriched three-fold in ^{124}Xe by thermal diffusion was studied. Details of the characteristics of the installation and the process, as well as the performances which can be expected during continuous working are given. The difficulties encountered during the experimental phase, as well as the solutions found for ensuring the required routine production, are described. (auth)

46134 ^{237}Np. Chesne, Andre (CEA-CEN, Fontenay-aux-Roses, France). Ind. At., 10: No. 7-8, 71-9(1966). (In French).

A review is given of the production and uses of ^{237}Np. The chemical properties of neptunium and the chief methods used for its recovery during chemical treatment of irradiated fuels are also discussed. (P.C.S.)

46135 PROGRESS IN PRODUCING STABLE ISOTOPES. Wetzel, K. Isotopenpraxis, 2: 277-84(July 1966). (In German).

The following topics are surveyed: physico-chemical basis of producing stable isotopes; production of stable isotopes on the basis of chemical-thermodynamic isotope effects (countercurrent distillation, chemical exchange, exchange distillation); production of stable isotopes on the basis of chemical-kinetic isotope effects; production of

stable isotopes on the basis of molecular-kinetic isotope effects (thermal diffusion, gas diffusion, separation nozzle, gas centrifuge, electromigration, molecular distillation); and some aspects of producing stable isotopes. (76 references.) (auth)

46136 ^{198}Hg PRODUCTION FROM NEUTRON-EXPOSED GOLD TARGETS. Hladik, O.; Jantsch, J. Isotopenpraxis, 2: 295(July 1966). (In German).

A distillation technique for ^{198}Hg production from neutron-exposed gold targets for spectroscopic purposes is described. The isotopic purity of the products obtained was better than 99%. (auth)

46137 SEPARATION OF STABLE ISOTOPES BY SIMULTANEOUS DISPLACEMENT IN ION-EXCHANGE COLUMNS. Wetzel, K.; Schuetze, H.; Farjo, K. (Institut fuer Stabile Isotope, Deutsche Akademie der Wissenschaften zu Berlin, Leipzig). Kernenergie, 9: 203-7(June 1966). (In German).

The phase inversion in isotope separation by chemical exchange is attained chemically. The heat released during the phase inversion reaction must be removed by cooling and is lost unutilized. While in isotope separation by counter-current distillation the evaporator serving as a mean for phase inversion is fed with no more heat than is necessary for evaporating the liquid (except of a small amount of energy which is necessary for compression of the steam-pressure drop of the column), in isotope separation by chemical exchange heat is wasted. Rational connection of several separation processes in a "simultaneous process" guarantees utilization of these resources. Simultaneous displacement of HCN/CN^-- and H_2SO_3/HSO_3^--bands in an anionite column shows that the specific investment cost and cost of the chemicals may be reduced by using the method proposed to one-half that of the conventional techniques. (auth)

46138 SEPARATION OF ISOTOPES WITH A COUNTER-CURRENT GAS CENTRIFUGE. EFFECT OF THE PROFILE AND RATE OF THE GAS FLOW UPON THE SEPARATION EFFICIENCY. Kanagawa, Akira; Oyama, Yoshitoshi; Takeshima, Yoichi. Tokyo Kogyo Daigaku Gakuho, 49: 151-65(1962).

The separation efficiency of a countercurrent gas centrifuge is investigated as a function of the flow rate and flow profile in the rotor. From the equation for the diffusion rate an optimal gas concentration gradient was obtained, at which the centrifuge had its greatest separation efficiency. Separation factor and separation efficiency achieve a maximum at the optimal rotation rate. The maximum value of the separation efficiency increases with increasing flow rate. (auth)

MATHEMATICS AND COMPUTERS

Refer also to abstracts 45829, 46061, 46536, and 46934.

46139 (PUC–937-175) DATA REDUCTION PROGRAM HYPERFINE-4A. Phillips, E. A. (Princeton Univ., N. J. Palmer Physical Lab.). Oct. 1965. Contract AT(30-1)-937. 41p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The program HYPERFINE-4A is the Princeton revision of the Berkeley atomic-beam group program HYPERFINE-4. It calculates the best fit of hyperfine-structure parameters A, B, C, g_J, μ_I to a collection of atomic magnetic-resonance data. Any subset of these parameters may be varied and fitted by the method of least squares, while the rest are held fixed. The input data are observations of frequency for a magnetic hyperfine transition and the magnetic field at which it occurs. The program must calculate the frequencies at which the transitions are expected; an alternate mode of operation creates a table of these expected values versus magnetic field. (auth)

46140 (WAPD-TM–611) GRAPHIC DISPLAY OF NUMERICAL DATA. DiLeonardo, D. J. (Bettis Atomic Power Lab., Pittsburgh, Pa.). Apr. 1966. Contract AT(11-1)-Gen-14. 38p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Four computer programs that use projection equations to develop perspective, stereographic, isometric, and horizontal (contour) projections from PDQ-5 output tape or from data stored on tape in PDQ-5 format are described. STEREO (MO730) draws perspective and stereographic views of PDQ-5 neutron flux and power; MO637 draws isometric views of PDQ-5 neutron flux and power; MO682 draws isometric views of PDQ-5 isotope concentration distributions; MO694 draws contour plots of PDQ-5 neutron flux and power. The graphic displays are developed by means of a line plotter or a cathode ray tube using output from the PDQ-5 neutron diffusion theory program. Input instructions to the FORTRAN programs that use the projection formulas developed are detailed in the appendixes. (A.G.W.)

METALS, CERAMICS, AND OTHER MATERIALS

General

Refer also to abstract 46239.

46141 (BNWL-SA-689) GRAPHITE: ADVANTAGES, LIMITATIONS, AND APPLICATIONS. Nightingale, R. E. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). May 5, 1966. Contract AT(45-1)-1830. 24p. (CONF-661003-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From AIME Nuclear Metallurgy Symposium on High Temperature Nuclear Fuels, Delevan, Wis.

The properties of graphite and some advantages and limitations in its use in high-temperature nuclear applications are reviewed. Fabrication, crystal structure, nuclear properties, strength, thermal conductivity, chemical properties, and density are discussed. Uses of graphite as moderator material and as matrix material for fuel particles are considered briefly. (A.G.W.)

46142 (GEAP-4877) DIFFUSION OF PLUTONIUM AND URANIUM IN OXIDE FUEL AT 2400 DEG C. Davies, J. H.; Novak, P. E. (General Electric Co., Pleasanton, Calif. Vallecitos Atomic Lab.). Mar. 1966. Contract AT(04-3)-189. 23p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The self-diffusion coefficients of U and Pu were measured in $UO_{2.03}$ at 2400°C to be $D_U = 2.6 \times 10^{-10}$ cm^2/sec, and $D_{Pu} = 3.4 \times 10^{-10}$ cm^2/sec. Quantitative correlation of these measurements with the lower temperature (1300 to 1705°C) work of others must be speculative because of the possible differences in the dominant diffusion processes operative at the widely differing temperatures of the several investigations. However, these observed diffusion coefficients are well within the limits of uncertainty expected in the extrapolation of lower temperature values. (auth)

46143 (HW-66081) QUARTERLY PROGRESS REPORT [ON] PLUTONIUM METALLURGY OPERATION, APRIL, MAY, JUNE 1960. Wick, O. J. (General Electric Co., Richland, Wash. Hanford Atomic Products Operation). July 15, 1960. Contract AT(45-1)-1350. 98p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Research on Pu and Pu alloys and systems is summarized in the areas of physical and mechanical metallurgy, Pu fuels, and special fabrications of Pu and other radioactive materials. (J.R.D.)

46144 (HW-67765) QUARTERLY PROGRESS REPORT [ON] PLUTONIUM METALLURGY OPERATION, OCTOBER, NOVEMBER, DECEMBER 1960. Wick, O. J. (General Electric Co., Richland, Wash. Hanford Atomic Products Operation). Jan. 15, 1961. Contract AT(45-1)-1350. 98p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Research on several aspects of physical and mechanical metallurgy of Pu is summarized. Development of fabrication methods is reported, and fuel fabrication for PRTR is summarized. Irradiation testing of ceramic fuels containing Pu is reported along with research on Pu ceramics. Fabrication of special items using Pu and other radioactive materials is reported. (J.R.D.)

46145 (NASA-CR-54093) BORE SEAL TECHNOLOGY TOPICAL REPORT. RESEARCH AND DEVELOPMENT PROGRAM ON MAGNETIC, ELECTRICAL CONDUCTOR, ELECTRICAL INSULATION, AND BORE SEAL MATERIALS. Kueser, P. E.; Toth, J. W.; McRae, R. C. (Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.). Dec. 1964. Contract NAS3-4162. 282p.

Thermophysical, compatibility, and mechanical property data on ceramic-to-metal seal technology of interest to the design of advanced space electric power systems are presented. It represents a thorough search of the recent world literature on this subject and a bibliographic record on this topic. The application of ceramic-to-metal bore seals to actual designs is described and discussed. The thermophysical and mechanical properties at elevated temperatures of selected ceramic and metallic members are reported. The materials include high-purity Al_2O_3, high-purity BeO, Nb-1Zr alloy, Ta T-111, and Nb D-43. Two major methods of joining ceramic to metals were investigated: the metalizing braze method and the direct-bonding, active-metal braze process. The joints produced by the metalizing method were too brittle to ensure an adequate seal. The active-metal braze was used on the representative bore seals. Of the active-metal systems studied for the ceramic-to-metal seal, the 56% Zr, 28% V, 16% Ti system proved to be the most satisfactory. Alkali-metal exposure tests show that for best results, the silica content of the ceramic must be held below 50 parts per million. Static capsule tests were used for the quantitative evaluation at 1000°F and 1600°F for compatibility of the bore seal materials and brazed assemblies with very high-purity K, Li, and Na-K eutectic alloy. Emphasis was placed upon maintaining very low O_2 level of the alkali metals throughout the loading procedure. The most promising system for Li exposure at 1000°F or for K exposure at 1600°F consists of a ceramic body of Thermalox 998 BeO (99.8 BeO), brazing alloy of 56% Zr, 28% V, 16% Ti, and a metal member of Nb-1% Zr. All tested specimens were vacuum tight after exposure. (auth)

46146 (Y-KE-204(Rev.)) MACHINING AND MEASUREMENT TO SUBMICRON TOLERANCES. Whitten, L. G.; Lewis, T. G. (Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant). Sept. 8, 1966. Contract W-7405-eng-26. 41p. (CONF-660922-1). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From 7th International Machine Tool Design and Research Conference, Birmingham, England.

The design of a machine capable of turning an Al alloy hemisphere 4 in. in diameter and deviating at no point more than 25 μ in. from that diameter is described. Typical machining and measurement procedures used in operating the machine are outlined. The machine is to be used as an instrument for studying individual machining variables. Details of air bearing design considerations, interferometer measuring systems, and temperature sensors are given in appendixes. (A.G.W.)

46147 (NASA-TT-F-359) METALLURGY OF RARE METALS. Second Edition, Revised and Enlarged. Zelikman, A. N.; Krein, O. E.; Samsonov, G. V. Translation of Metallurgiya Redkikh Metallov, Izdatel'stov Metallurgiya, Moscow, 1964. 512p. (TT-65-50137; IPST-Cat.-1455). CFSTI $8.12 cy, $2.25 mn.

This book treats the metallurgy of the following metals: refractories (W, Mo, Ta, Nb, Ti, Zr); rare earths; scattered metals (Ge, Ga, In, Tl, Re); and light metals (Be, Li). Emphasis is placed on the physicochemical properties of each metal and on the processes for production of the pure metal and its compounds. (D.L.C.)

46148 QUESTIONS CONCERNING THE RAW MATERIAL FOR THE USE OF STAINLESS STEEL SHEETS AND TUBES IN THE CONSTRUCTION OF REACTORS. [PART] I. Gruetzner, Guenther; Jesper, Heinz. Blech, 11: 503-11(Oct. 1964). (In German).

The importance of reactor engineering to production of power is discussed. Other discussion and information is presented concerning the corrosion behavior and properties of stainless steels as related to reactor construction and operation, and the effects of neutrons on the properties of these steels. (J.R.D.)

46149 QUESTIONS CONCERNING THE RAW MATERIAL FOR THE USE OF STAINLESS STEEL SHEETS AND TUBES IN THE CONSTRUCTION OF REACTORS. [PART] II. Gruetzner, Guenther; Jesper, Heinz. Blech, 11: 590-7(Nov. 1964). (In German).

The importance of reactor engineering to production of

power is discussed. Other discussion and information is presented concerning the corrosion behavior and properties of stainless steels as related to reactor construction and operation, and the effects of neutrons on these steels. (J.R.D.)

46150 GALLIUM: BULLETIN BIBLIOGRAPHIQUE 1966. 4eme Supplement a la Bibliographie Publiee en 1962. (Gallium: Bibliographic Bulletin 1966. 4th Supplement to the Bibliography Published in 1962). Zurich and Neuhausen, Switzerland, Aluminium Suisse S. A., 1966. 276p. Available from AIAG Metals Inc., New York.

References are presented under the following headings: general, geochemistry, preparation and purification, properties of the element, specific solid compounds, other compounds, analysis, and physiological properties. An author index, corporate author and country index, and an index of universities and societies to which the authors belong are included. (M.C.G.)

46151 PLUTONIUM SURVEY, 1964. Prepared for the EEI Policy Committee on Atomic Power by the EEI Committee on Nuclear Fuels. New York, Edison Electric Institute, 1965. 24p.

Results of the survey indicate that Pu has a value at least equal to ^{235}U as fuel for thermal reactors. Research programs are in progress aimed at the use of Pu in thermal and fast reactors. Significant quantities of high-exposure Pu are now available making possible measurements and investigations necessary for its use in these reactors. (J.R.D.)

46152 METHOD OF PRODUCING URANIUM DIOXIDE POWDER. Suehiro, Yoshiyuki; Takashima, Akio; Suzuki, Takashi; Doi, Hidekazu. U. S. Patent 3,272,602. Sept. 13, 1966. Filed Dec. 9, 1960.

Production of UO_2 having homogeneous particles at 2 to 150 μ dia and particle density of 98% is described. The method comprises precipitation of ammonium diuranate (ADU) from aqueous solution of uranyl salt, drying and decomposition of the ADU to UO_3 and U_3O_8, and reducing the oxides to UO_2. (J.R.D.)

46153 STABILIZED ZIRCONIA COMPOSITION. Brixner, Lothar H. (to E. I. du Pont de Nemours and Co.). U. S. Patent 3,268,349. Aug. 23, 1966. Filed Oct. 20, 1964.

Preparation of compositions containing ZrO_2 which are stabilized against crystallographic phase change is described. The stabilization is achieved by solid solution formation between ZrO_2 and niobates of lanthanides having atomic numbers 64 through 71. The generic formula of the solid solutions is $Ln_x Nb_x Zr_{1-2x}O_2$. (J.R.D.)

Corrosion

Refer also to abstract 46166.

46154 (NASA-CR-72035) CAVITATION DAMAGE IN LIQUID METALS. Final Report. Thiruvengadam, A.; Preiser, H. S. (Hydronautics, Inc., Laurel, Md.). Nov. 29, 1965. Contract NAS 3-4172. 76p. (TR-467).

A summary is presented of the results of investigations on the cavitation damage resistance, the high-frequency fatigue, and the stress corrosion behavior of five alloys in liquid Na up to 1500°F. Stellite 6B exhibits the greatest resistance as compared with Cb-132M, T-222, TZM, and 316 stainless steel. The rate of damage decreases with increasing temperature. High-frequency fatigue tests at ~35 ppM and at ~100 ppM oxide contamination in liquid Na up to 1500°F show that the oxide content does not change the fatigue behavior of TZM and 316 stainless steel. The fatigue of 316 stainless steel in 1500°F Na at 14,000 cps is comparable with the results obtained at 1500°F vacuum (3×10^{-5} torr) at 4-5 cps. No stress corrosion cracking was observed on TZM and on 316 stainless steel over a 60 hour test at two oxide levels (~35 ppM and ~100 ppM) in liquid Na at two temperatures (1000°F and 1500°F) up to 100 percent yield. (auth)

46155 PROTECTION OF GRAPHITE FROM OXIDATION AT 2100 DEG C. Criscione, J. M.; Volk, H. F.; Smith, A. W. (Union Carbide Corp., Parma, Ohio). Contract AF 33(657)-11235. AIAA (Amer. Inst. Aeron. Astronaut.) J., 4: 1791-7(Oct. 1966).

Complete oxidation protection of graphite was achieved at temperatures up to 2100°C through the use of Ir coatings. O_2 permeability measurements show that Ir is virtually impervious to O_2 up to 2200°C, and C diffusion through Ir also was found to be slow. Coating methods investigated include slurry-dipping and sintering, foil cladding, vapor plating, and electroplating. Best results were obtained by a combination of several methods. The Ir-coated graphite was subjected to plasma torch tests at both atmospheric and subatmospheric pressures. In all tests, complete protection of the graphite substrate was achieved. At atmospheric pressure and 2050°C, the recession rate of the coating was 0.0054 in./hr. At stagnation pressures of about 45 torr and 2050°C, the recession rate was too small to be determined. It is suggested that Ir coatings also might protect refractory metals from oxidation. (auth)

46156 STUDY ON CAST U AND Pu CARBIDES. Boucher, R.; Barthelemy, P.; Milet, C. (CEN, Fontenay-aux-Roses, France). Mem. Sci. Rev. Met., 63: 543-54 (June 1966). (In French).

The fabrication, structure, physical properties, and behavior under air corrosion were studied for the alloy systems U–C–Mo, U–C–Ti, U–C–Zr, U–Pu–C–Mo, and U–Pu–C–Zr. (J.S.R.)

46157 EFFECT OF CHROMIUM ON THE OXIDATION KINETICS OF NIOBIUM. Voitovich, R. F. (Inst. of Problems of Material Science, Academy of Sciences, Ukrainian SSR). Ukr. Khim. Zh., 32: 445-8(1966). (In Russian).

The oxidation of Nb alloy with 10, 30, 50, 70, or 90% Cr at 500, 600, 700, 800 or 900°C was studied. The alloys were melted in a vacuum arc furnace with a W electrode from 99.8%-pure Nb and electrolytic Cr. Alloy specimens were homogenized at 1000°C for 20 hr. Cr was found to decrease somewhat the strength of Nb, but to increase sharply the resistance against oxidation, particularly at temperatures up to 800°C. The alloy with a Cr content over 30% showed a slight weight gain at all temperatures in 10-hr tests. Cr promoted the formation of β-niobium pentoxide and shifted the upper limit of α-phase stability from 900°C for pure Nb to 600°C for Nb + 10% Cr alloy. In the presence of Cr, a new oxide phase was formed (apparently $CrNbO_4$ oxide) which slows down the diffusion of O_2 through the oxide layer. (ATD)

46158 CORROSION RESISTANCE OF MOLYBDENUM ALLOYS IN SULFURIC, HYDROCHLORIC, AND PHOSPHORIC ACIDS AT ELEVATED TEMPERATURES UNDER PRESSURE. Gulyaev, A. P.; Ababkov, V. T. (Moscow Inst. of Chemical Machinebuilding). Zashchita Metal., 2: 444-9(1966). (In Russian).

The corrosion behavior of three Mo-base alloys, arc-cast alloy TsM-2A (0.1% Ti, 0.1% Zr), sintered Mo–Zr, and Mo–W–Y–C alloys, in H_2SO_4, HCl, and H_3Po_4 at boiling temperatures and at 185°C was tested. In boiling H_2SO_4 at concentrations up to 60% all the alloys tested had a corrosion rate below 0.1 mm/year. With increasing acid concentration the corrosion rate increased sharply, to 1 mm/year at 70% concentration and 10 mm/year at 80% concentration. At 185°C the corrosion rate of none of the alloys exceeded 0.1 mm/year at acid concentrations up to 70% (80% for TsM-2A alloy). In boiling HCl at concentrations up to 20% the corrosion rate varied from 0.02 mm/year for TsM-2A alloy to 0.04 mm/year for Mo–Zr alloy. At 185°C an acid concentration of up to 35% had little or no effect on the corrosion rate, which varied from 0.005 mm/year for TsM-2A alloy to 0.02 mm/year for Mo–W–Y–C alloy. In H_3Po_4 at concentrations up to 90% none of the alloys tested corroded at a rate higher than 0.04 mm/year. (ATD)

46159 ZIRCONIUM BASE ALLOYS. Winton, John; Murgatroyd. Robert (to United Kingdom Atomic Energy

Authority). U. S. Patent 3,271,205. Sept. 6, 1966. Priority date Mar. 27, 1963, Great Britain.

An invention relating to a binary alloy of Zr and Nb with 1 to 4% Nb and 1000 to 2000 ppM O^2 is described. The alloy is predominantly martensitically transformed beta phase with a fine dispersion of second-phase precipitate rich in Nb. The alloy is satisfactory for use in steam and water in reactors. (J.R.D.)

Fabrication

Refer also to abstracts 45622, 45659, 45684, 45793, 45794, and 46159

46160 (AD-638453) SEMI-CONTINUOUS PRESSURE SINTERING. Summary Report, May 3, 1965–April 29, 1966. Rice, R. W.; Hunt, J. G. (Boeing Co., Seattle, Wash. Aerospace Group. Nuclear Metals, Inc., West Concord, Mass.). May 1966. Contract NOw65-0382-c. 66p. CFSTI $3.00 cy, $0.75 mn.

A process of semicontinuous pressure sintering was proposed wherein a ceramic powder was to be encapsulated in a suitable metal tube and subsequently densified by combinations of rolling, swaging, and drawing at various temperatures. Requirements for development of the process were established and essentially met. No adaptation of facilities was found necessary for room temperature rolling or for swaging at temperatures of at least 1100°C. Hot drawing facilities were readily adapted using ZrO_2 dies shrunk into TZM holders. Stainless steel tubes were found to have adequate chemical compatibility with both the process parameters and the MgO. These tubes were also found to be generally mechanically compatible with the ceramic and process parameters for all operations except hot drawing. However, hot swaging, which was readily accomplished, appears to do the job expected of hot drawing. Fine, active MgO powders showed good compaction, achieving as much as 90% of theoretical density at room temperature; good sinterability, particularly with LiF which allows densification at least as low as 700°C; and some creep plasticity especially with LiF during final densification that helped cope with tube elongation. Best results were obtained with MgO + LiF. Swaging at progressively increasing temperatures to 750°C, then firing at 1000°C (in the sealed tube) resulted in essentially crack- and inclusion-free sections up to 98% of theoretical density. Further firing of the MgO in air to 1200°C resulted in translucency (over 99% of theoretical density). It was concluded that the process is indeed feasible, and an outline of steps and parameters is presented. (auth)

46161 (AD-639838) BI-MONTHLY PROGRESS REPORT [ON DEVELOPMENT OF SOLID SOLUTION STRENGTHENED HIGH PURITY BERYLLIUM ALLOY SHEET], JUNE–JULY 1966. Meyer, G. E. (Beryllium Corp., Reading, Pa.). Aug. 29, 1966. Contract NOw-66-0563-c. 8p. CFSTI $1.00 cy, $0.50 mn.

Copper additions to high purity Be yield an alloy with good casting characteristics. Only the increased extrusion forces required to extrude the alloy billets differentiated the alloy extrusions from conventional Be ingot extrusions. The degree of surface roughness of the extruded alloy slabs was greater than the roughness of pure Be slabs, and this roughness could be related to the grain size variation in the casting. (auth)

46162 (ANL-6621) PROCUREMENT AND PROCESSING OF EBR-I CORE IV URANIUM AND HARDWARE. Final Report. Beatty, R. A.; McCuaig, F. D.; Bean, C. H. (Argonne National Lab., Ill.). Mar. 1966. Contract W-31-109-eng-38. 41p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Jacket assemblies plus other components of Zr alloys, stainless steel, and U were manufactured for the Pu fuel rods, depleted-U blanket rods, and thermocouple rods for the Core IV loading of EBR-I. Considerable effort was expended to produce small-dia (0.760- and 0.203-cm-OD) Zircaloy-2 tubing and to inspect this tubing adequately for defects. Unidentified random imperfections were detected in Zircaloy-2 jacket tubing inspected by a dual-frequency eddy-current test system. A major cause for rejecting assemblies in x-ray inspection was a decrease in wall thickness resulting from spacer-rib welding and lower-end closure welding. It is recommended that future fuel elements be designed to take advantage of spacer-rib welding techniques that were developed to give a small weld-affected zone. Advanced techniques applied to the fabrication of small-dia, Zircaloy-2 fuel-jacket and thermocouple tubing are described. (auth)

46163 (BM-RI-6835) PREPARATION OF SUBMICRON TUNGSTEN POWDER BY HYDROGEN REDUCTION OF TUNGSTEN HEXACHLORIDE. Tress, J. E.; Campbell, T. T.; Block, F. E. (Bureau of Mines, Washington, D. C.). 1966. 14p. Bureau of Mines Free.

The Bureau of Mines prepared submicron W powder by reducing WCl_6 with H_2. The particle diameters of the resulting W powders ranged from 0.015 to 0.046 micron. Within the limits of the variables investigated, no clear-cut correlation was found between process conditions and final size of the powder. O_2 was the major contaminant in the product, being present both as an adsorbed gas and as suboxides of W. Studies showed that the powder yielded compacts of approximately 45 percent of theoretical density when compacted mechanically. Low-temperature sintering produced more rapid densification in these compacts than in compacts prepared from conventional powders. Adding up to 20 percent ultrafine powder to conventional W powder caused an increase in density upon compaction with maximum densification occurring at approximately 12 percent ultrafine powder. (auth)

46164 (DP-MS-66-8) METALLOGRAPHY OF ^{244}Cm OXIDES. Smith, P. K.; Livingston, J. T. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). June 9, 1966. Contract AT(07-2)-1. 14p. (CONF-660518-7). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 20th Metallographic Group Meeting, Rocky Flats, Colo.

Metallographic facilities and methods for production and fabrication of Cm_2O_3 fuels for isotopic heat sources are described. Information on microstructures of curium oxides is presented along with information on microstructures of spinels and perovskite-type ceramics produced by reaction between alumina and curium oxide at 1600°C. (J.R.D.)

46165 (NASA-TM-X-53453(Vol.3)) THE FABRICATION OF BERYLLIUM. VOLUME III. METAL REMOVAL TECHNIQUES. Williams, R. F.; Ingels, S. E. (National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center). Aug. 1966. 132p.

A description is given of the metal removal techniques developed for the fabrication of Be aerospace vehicle structures. Proven production techniques for the drilling, routing, and abrasive wheel cutting of both sheet and plate gages of material are presented. Established techniques for the precision machining of hot-pressed block and extruded rod are reviewed. Chemical milling solution strengths and metal removal rates are investigated; and the optimum Electrical Discharge Machining (EDM) power and frequency settings, and electrode materials, are correlated with the resulting metal removal rates, surface finishes, and elapsed machine times. Metallographic and microphotographic techniques were used for comparison and failure analyses. (auth)

46166 (NASA-TN-D-3597) INVESTIGATION OF COLUMBIUM-MODIFIED NASA TAZ-8 SUPERALLOY. Waters, William J.; Freche, John C. (National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center). Sept. 1966. 31p. CFSTI $2.00 cy, $0.50 mn.

The oxidation resistance of the NASA TAZ-8 alloy was substantially improved, and its workability potential and high-temperature strength characteristics were generally retained by replacing V with Nb and by adding small quantities of B. This modified version was designated TAZ-8A. The nominal composition of the alloy in wt %

is 2.5 Nb, 8 Ta, 6 Cr, 6 Al, 4 Mo, 4 W, 1 Zr, 0.125 C, 0.004 B, and the balance Ni. In the vacuum-melted condition after 310 hours in air at 1900°F the alloy showed a weight gain of 1.8 mg/cm^2. An Ar-melted 0.0215-in. rolled-sheet oxidation specimen had a weight gain of 0.5 mg/cm^2 after approximately 8 hr exposure at 1900°F. Substantially improved high-temperature oxidation resistance over other representative Ni-base alloys was observed in tests that measured wt gain and wt loss. The TAZ-8A alloy was hot rolled from cast strips 0.110-in.-thick to 0.020-in. strips on a conventional rolling mill. Such a reduction indicates at least limited workability potential. Ultimate tensile strengths of the as-cast alloy ranged from maximum values of 130,500 psi at room temperature to 8000 psi at 2200°F. In the as-rolled condition the ultimate tensile strengths were 240,000 and 6500 psi at these respective temperatures. At a stress of 15,000 psi the 500-, 100-, and 10-hr use temperatures were 1815, 1895, and 2010°F, respectively. (auth)

46167 (Y–1551) MACHINING AND FINISHING FINE-GRAIN BERYLLIUM. Hovis, V. M. (Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant). Oct. 12, 1966. Contract W-7405-eng-26. 34p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A study relating to the machining and finishing of complex shapes made of fine-grained, high-oxide Be is presented. Precision fabrication has been made possible by using a combination of conventional-machining and chemical-etching techniques. Work was done with both Grade S-200 and P-6 metal. (auth)

46168 PRODUCING SILICIDES OF RARE METALS BY ARC SMELTING. Dvorina, L. A.; Verkhoglyadova, T. S. Izv. Akad. Nauk SSSR, Metal., No. 6, 62-8(Nov.-Dec. 1965). (In Russian).

The formation of silicides of rare metals by arc smelting was experimentally investigated by alloying Si(99.9% pure) with Sc(97% pure), Y(95%), La(97.9%), Ce(98%), Pr, and Nd in different ratios and by performing x-ray phase and chemical analyses on the resulting alloys. Tables of the initial compositions and the final phase compositions of the various alloys are presented. It was found that to obtain the pure silicidic phase no excess of either component (over the stoichiometric ratio) was necessary for the Sc–Si system, while a 1.5–2.0% excess of Si was necessary for the Y, Pr, and Nd–Si systems and a 2–3% Si excess for the La and Ce–Si systems. Homogenization of the alloys for 5–7 hours in a high vacuum (10^{-5} mm kg) is recommended at 1600K for Sc and Y alloys and at 1370–1570K for Ce, La, Pr, and Nd alloys. Several new phases were established and are briefly discussed. (ATD)

46169 COLD-ROLLING AND ANNEALING BEHAVIOR IN NICKEL–THORIA SHEET, WITH PARTICULAR REFERENCE TO PREFERRED-ORIENTATION DEVELOPMENT. Mee, P. B.; Sinclair, R. A. J. Inst. Metals, 94: 319-26(Sept. 1966).

The effect of thoria particle dispersions on the cold-rolling and annealing behavior in nickel sheet was examined, with particular reference to texture development. The texture of heavily cold-rolled nickel–thoria sheet was found to be of the pure-metal type, i.e., {135} ⟨112⟩. Components of the type {hkl} ⟨001⟩ and, in particular, {110} ⟨001⟩, originating from the starting texture, were metastable, the degree of cold work necessary for degeneration of this component being a function of the initial milling and fabrication conditions. The breakdown of the {hkl} ⟨001⟩ component, and the loss of the banded nature of the material, was coincident with the formation of an equiaxed cell structure and severe thoria particle fragmentation. Deformation twins were observed, indicating that mechanical twinning is a possible mode of deformation in these materials. A considerable range of recrystallization texture was observed, which included {100} ⟨001⟩, {122} ⟨122⟩, {210} ⟨112⟩, {359} ⟨301⟩, and {445} ⟨1247⟩-type components. The exact nature of the texture was found to be dependent on the alloy concerned and also on the degree of deformation. All the recrystallized alloys possessed an unusually high frequency of first- and second-order annealing twins for a material of moderately high stacking-fault energy, presumably owing to the presence of local regions of high dislocation density or, perhaps more generally, local stress concentrations caused by the presence of thoria particles. (auth)

46170 FABRICATION OF FUEL ELEMENTS FOR THE ARGONAUT REACTOR OF THE INSTITUTE OF NUCLEAR ENGINEERING. Souza Santos, Tharcisio D.; Haydt, Heliton M.; Trench de Freitas, Clauer (Instituto de Energia Atomica, Sao Paulo, Brazil). Met., ABM (Ass. Brasil. Metais), 21: 369-76(May 1965). (In Spanish). (IEA–95).

Fabrication of Al-clad cermet fuel plates composed of 54.4% U_3O_8 and 45.6 Al is described. Each fuel element is composed of 17 plates of 610 mm by 73 mm by 2.42 mm thick, containing a cermet core with the indicated composition and with the dimensions of 585 to 590 mm long, by 58.5 mm wide by 1.86 mm thick. The average thickness of the Al coating is 0.28 mm. The principal fabrication steps starting from materials preparation and finishing with the main results obtained in test on the produced plates are described. (J.R.D.)

46171 BETON V ZASHCHITE YADERNYKH USTANOVOK. (Concrete for Shielding Nuclear Installations). Broder, D. L.; Zaitsev, L. N.; Komochkov, M. M.; Malkov, V. V.; Sychev, B. S. Moscow, Atomizdat, 1966. 240p.

The bases for design calculations in constructing concrete shielding for nuclear reactors and elementary particle accelerators are presented. These are the results of experimental and theoretical analyses of the shielding properties of the concretes. A large number of references is included in a form that lends itself to the quick calculation of shielding parameters. Some technological factors, thermoelastic tensions, and various technical-economic considerations of concrete shielding materials are given. (G.O.Y.)

46172 PRESENT AND FUTURE STATE OF USE OF THE PLASMA SPRAY IN THE TECHNOLOGY OF HIGH AND VERY HIGH TEMPERATURE. Perugini, Giancarlo. Termotecnica, 18: 661-78(1964). (In Italian).

The properties of plasma and the devices used for the production of plasma jets are described. The characteristics of some gas plasmas are considered. The economics of the arc plasma and the plasma spray are examined. The behavior of powders in the plasma jet is described. The characteristics of coatings and thermal barriers produced with the plasma spray are discussed. (J.S.R.)

46173 ROLLING OF TUNGSTEN AND MOLYBDENUM UNDER CONDITIONS OF LOW PARTIAL PRESSURES OF OXYGEN. Krupin, A. V.; Pavlov, I. M.; Linetskii, B. L.; Chernyshev, V. N.; Zarapin, Yu. L.; Starkov, V. N.; Korchagin, P. A.; Vinogradov, V. V.; Tyukalov, T. V. Tsvetn. Metal., No. 5, 93-4(1966). (In Russian).

W and Mo plates (8 × 40 × 150 mm) preforged or prerolled from sintered ingots were hot rolled in air, argon containing 0.03% O_2 and 0.01% N_2, or in a vacuum of 0.1–0.005 mm Hg. W was rolled at 1200, 1300, and 1450°C with reductions of 10, 20, and 30% per pass; Mo was rolled at 950, 1050, and 1150°C with reductions of 10, 20, 30, 50, and 55% per pass. A sharp increase in the roll pressure, torque, forward slip, and friction coefficients was observed with change from air atmosphere to a pressure of 0.1 mm Hg. This was caused by increased friction. Lowering the pressure from 0.1 to 0.005 mm Hg had little or no additional effect. Increasing the rolling temperature in vacuum of 0.01 mm Hg had an insignificant effect on the specific pressure in rolling Mo, but appreciably decreased the specific pressure in rolling W, e.g., from 74 to 1200°C to 64 and 60 kg/mm^2 at 1300 and 1450°C, respectively. The specific pressure increased with increasing reduction. In rolling W in a vacuum of 0.1 mm Hg, increasing the reduction from 20 to 30% led to a specific pressure increase from 74 to 91 kg/mm^2 at 1200°C and from 60 to 69 kg/mm^2 at 1450°C. In rolling Mo the specific pressure increased from 44 to 96.5 kg/mm^2 with increasing reduction from 10

to 45% at 1050°C. In vacuum rolling at high temperatures and reductions a sticking of metal to the rolls was observed. In rolling of W at 1450°C with a reduction of 35%, an intensive sticking resulted in splitting of metal. Little or no sticking was observed at 1200°C. Noticeable sticking was observed in rolling Mo at 1150°C. (ATD)

46174 REFINING LANTHANUM BY COMBINED ZONE MELTING AND ELECTROTRANSFER PROCESS. Amonenko, V. M.; Pavlov, V. S.; Kruglykh, A. A. (Physicotechnical Inst., Kharkov). Ukr. Fiz. Zh., 11: 1023-5(1966). (In Ukrainian).

The feasibility of refining by combined zone melting and electrotransfer process was investigated. Specimens, 8 mm in diameter × 120 mm long, were prepared from 99.5%-pure La melted in a vacuum of $3 \cdot 10^{-6}$ mm Hg. The specimens were subjected to zone refining in vacuum with electron-beam heating. Simultaneously, direct current with a density of 4.4 a/mm² was passed through the specimens for 70 or 180 hr, depending on the number of passes (5 or 10). It was found that the utmost purification was achieved with 5 passes, after which the impurities content was reduced as follows: Oxygen from 0.080% to 0.032%, N from 0.0047% to 0.0040%, H from 0.0013% to an undetectable quantity, and C from 0.14% to 0.080%. The microhardness dropped from 50 to 30 kg/mm². (ATD)

46175 INJECTION CASTING OF 10Pu–Al ALLOY FUEL ELEMENTS. Miller, Gary E. (Nuclear Materials and Equipment Corp., Apollo, Pa.). 16p. (CONF-660606-29). ORAU. Gmelin, AED-CONF-66-203-53.

From American Nuclear Society Meeting, Denver, Colo.

850 fuel elements encapsulated in Zircaloy-2 were fabricated using glass molds. It was found that injection casting of this alloy in Pyrex molds is rapid and economical. It was also found that Pu segregation can be reduced by stirring the melt and that Pu content can be determined accurately by radiochemical analysis. (J.R.D.)

46176 FILAMENT REINFORCED REFRACTORY COMPONENTS FOR HIGH PERFORMANCE ROCKET MOTORS. Cheatham, Robert G.; Grenning, Thomas A. 22p. (CONF-660319-4). ORAU. Gmelin, AED-CONF-66-041-2.

From American Society for Metals Sessions, WESTEC Conference, Los Angeles.

A composite consisting of helical and circumferentially wound W wires embedded in plasma-sprayed W matrix for rocket motor components is discussed. Fabrication methods are reviewed and test results are discussed. (J.R.D.)

46177 SOME EXPERIENCE IN THE FABRICATION OF PLUTONIUM BEARING PELLETS. North, E. D. 12p. (CONF-660616-3). ORAU. Gmelin, AED-CONF-66-185-4.

From Institute of Nuclear Materials Management 7th Annual Meeting, Columbus, Ohio.

Pellets containing 0.3% PuO_2 in depleted UO_2 were produced with a diameter tolerance of ±2 mils. Design criteria for Pu-handling equipment, problems encountered in Pu processing, and health and safety problems are reviewed. It is concluded that cost of Pu-containing pellets will be greater than cost of U pellets as long as Pu continues to be processed in the typical glove box with its attendant restrictions. (A.G.W.)

46178 METHOD FOR THE FABRICATION OF A FUEL ELEMENT FOR NUCLEAR REACTORS. Bowden, Andrew Thomson (to C. A. Parsons and Co. Ltd.). German Patent 1,220,532. July 7, 1966. Priority dates July 11, 1958 and June 10, 1959, Great Britain.

A nuclear fuel element comprising a solid fuel body having on its surface recesses and housed in a sheath is inserted into the core of a nuclear reactor. Under operating conditions in the reactor the expansions of the stainless steel relative to the fuel is considerable and the pressure of the cooling medium in the core forces the material of the flexible sheath into the recesses and this maintains contact with the surface of the fuel and takes up the expansion of the sheath. (auth)

46179 PROCESS FOR PRODUCING A DIFFUSIONLESS BOND BETWEEN METALS. Watson, Robert D. (to Atomic Energy of Canada Ltd.). U. S. Patent 3,270,413. Sept. 6, 1966. Filed Dec. 2, 1963.

A patent is described relating to diffusionless bonding of dissimilar metals such as stainless steel and Al, Zr and Al, Zircaloy and Al–Zr alloys, and U and Al. A thin oxide layer is formed on the tube that is to be fabricated, an encircling layer of Al is extruded on the tube surface, and a portion of the end of the tube is cut away such that an extending collar of Al is left. The extending collar facilitates welding to other Al collars or tubes. (J.R.D.)

46180 NUCLEAR FUEL OR BREEDER ELEMENT AND METHOD OF FABRICATION. Spies, Johannes (to Gesellschaft fuer Kernforschung mit Beschraenkter Haftun). German Patent 1,219,596. June 23, 1966. Filed Apr. 10, 1963.

To improve the heat-conducting properties of a fuel element comprising granular fissionable substances which are poor electrical conductors (UO_2), a material with good heat-conducting properties is added. The grain size of the fuel is in the order of the effective depth of penetration (0.1 μ) of the charge carriers (electrons). The method comprises the steps of sintering together the grains of fuel and the material having good heat-conducting properties and of grinding the body obtained to grains having an optimum size. (auth)

46181 METHOD OF FORMING A DEVITRIFIED GLASS SEAL WITH TUNGSTEN OR MOLYBDENUM. Stookey, Stanley D. (to Corning Glass Works). U. S. Patent 3,268,315. Aug. 23, 1966. Filed Mar. 26, 1962.

A method is described of fabricating high-strength glass-ceramic bodies having good electric insulating properties for use at elevated temperatures in reducing atmospheres. The material is prepared by melting SiO_2, MgO, Al_2O_3, and Cr_2O_3. The melt is shaped into a glass body of desired configuration and cooled. Details of composition and heat treatments are included. (J.R.D.)

Properties and Structure

See also CHEMISTRY — Inorganic and Physical Chemistry
PHYSICS — Solid State Physics

Refer also to abstracts 46539, 46540, and 47010.

46182 (AD-630070) SHORT-TIME, HIGH-TEMPERATURE CREEP STRENGTH OF MOLYBDENUM-0.5 PERCENT TITANIUM. Akridge, James M. (Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.). Nov. 1965. Contract NOw-62-0604-c. 94p. CFSTI $9.60 cy, $0.75 mn.

Thesis. Submitted to Maryland Univ., College Park.

Short-time, high-temperature creep tests were conducted on a Mo 0.5% Ti alloy. Test samples were one-half inch wide × 0.060 inch thick Mo strip in the stress-relieved condition. Prior to testing the samples were coated with a silicide oxidation resistant coating (Pfaudler PFR-6). The tests were conducted at four stress levels ranging from a low of 8470 psi to a high of 20350 psi. Temperatures ranged from 2300 to 3000°F. Time under load was in general less than 1000 seconds. The creep strength of this alloy was found to decrease very rapidly with increasing temperature at temperatures between 2300 and 2600°F. At temperatures above 2600°F strength decreased less rapidly with increasing temperature. This phenomenon is believed to be caused by recrystallization and grain growth at temperatures between 2300 and 2600°F. At temperatures above 2600°F recrystallization was essentially complete before the sample was loaded, approximately 15 seconds, resulting in less sensitivity to temperature in this range. (CFSTI)

46183 (AD-630427) SURVEY OF CURRENT KNOWLEDGE OF THE DEFORMATION CHARACTERISTICS OF BERYLLIUM, THE REFRACTORY METALS, AND THE SUPERALLOYS. Final Technical Report, February 10, 1965–February 10, 1966. Boulger, F. W.; Gerds, A. F.; Glaeser, W. A.; Henning, H. J.; Hopper, A. T. (Battelle Memorial Inst., Columbus, Ohio). Contract NOw-65-0259-C. 322p. CFSTI $7.00 cy, $1.50 mn.

The following subjects are covered: theory of plasticity, high-velocity forming, work-hardening mechanisms in metals, shear forming and spinning of metals, friction and wear in metal-deformation processes, rod, wire, and tube drawing, and applications of static high pressure to the forming of metals (hydrostatic extrusion). (TAB)

46184 (EURAEC-1677) DETERMINATION OF THE TRANSFORMATION CURVES FOR CONTINUOUS COOLING OF Mn–Mo STEEL FROM 1100 DEG C. Study No. 965. Special Report No. 14, April 1–June 30, 1966. (Chantiers de l'Atlantique Saint-Nazaire (France)). Apr. 25, 1966. Contract 054-61-12-RDF. 12p. (EUR-2867). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

The transformation curves for continuous cooling of Mn–Mo–V steel were determined under Ar. The specimens were austenitized at 1100°C for 30 min. Various types of cooling, from quenching in water to cooling at a controlled rate of 50°C/hr, were applied. Results of micrographic examinations of structure are shown. The transformation diagrams are compared with transformation diagrams plotted after austenitization at 920°C; no significant difference is found. (A.G.W.)

46185 (GEAP-4675) SOME ELECTRICAL PROPERTIES OF THE PLUTONIUM–URANIUM MIXED OXIDE SYSTEM. Baily, W. E.; Lyon, W. L. (General Electric Co., San Jose, Calif. Advanced Products Operation). Sept. 1965. Contract AT(04-3)-189. 21p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A study was conducted on the electrical properties of mixed oxides of (PuO_2-UO_2) solid solutions to establish a better understanding of this system, with particular attention being given to compositions of interest as fast ceramic reactor fuels. Both electrical resistivity and thermoelectric power measurements were made across the PuO_2-UO_2 binary system and on $(Pu_{0.2}U_{0.8})O_{2\pm x}$ and $UO_{2\pm x}$ specimens with O-to-metal ratios between 1.97 and 2.10. Generally the electrical resistivity and thermoelectric measurements varied as a function of solute content. No step changes in properties were observed. Mixed oxide specimens with stoichiometries between 1.97 and 2.01 were found to be defect structures with only a trace of second phase present. (auth)

46186 (GEAP-5014) FRACTURE TOUGHNESS OF SOME ENGINEERING ALLOYS. Reynolds, M. B. (General Electric Co., Pleasanton, Calif. Vallecitos Atomic Lab.). Mar. 1966. Contract AT(04-3)-189. 12p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A summary is given of published fracture mechanics data for the following alloys: A302B steel for pressure vessels, turbine/generator rotor steels, Zircaloy-2, and Al alloys. The data tabulated include yield stress, fracture toughness, and critical stress intensity factor. The effects of temperature on fracture toughness are given. (D.L.C.)

46187 (LFEN-39) EQUILIBRIO DE FASES NO SECTOR URANIO–UCo_2–UFe_2 DO SISTEMA URANIO–COBALTO–FERRO. (Phase Equilibria in Uranium–Cobalt–Iron Alloys in the Partial Range U–UCo_2–UFe_2). Petzow, Gunter; Sampaio, A. Oliveira (Laboratorio de Fisica e Engenharia Nucleares, Junta de Energia Nuclear, Sacavem (Portugal)). 1965. 20p. Dep. mn.

The system U–UCo_2–UFe_2 was investigated using metallographic, thermal, dilatometric, chemical, and x-ray methods. Isothermal sections at 750 and 700°C and four temperature-concentration sections were worked out and present a good survey of the phase spaces. A non-variant 4-phase equilibrium was found at 730°C. U_6Co and U_6Fe, and UCo_2 and UFe_2, respectively, exhibit complete solid solubility. The solubility of ternary additions in UCo and α-U is practically nil, and in β-U and γ-U it is very small. (auth)

46188 (NASA-CR-54092) ELECTRICAL CONDUCTOR AND ELECTRICAL INSULATION MATERIALS TOPICAL REPORT. RESEARCH AND DEVELOPMENT PROGRAM ON MAGNETIC ELECTRICAL CONDUCTOR, ELECTRICAL INSULATION, AND BORE SEAL MATERIALS. Kueser, P. E.; Neff, W. S.; Lane, D. H. (Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.). Oct. 1964. Contract NAS3-4162. 782p.

Thermophysical, electrical, and mechanical property data on electrical conductor and electrical insulation materials of interest to advanced space electric power systems are given. It represents a thorough search of the recent literature on these subjects and a bibliographic record on these topics. Tests were run under consistent guidelines to provide reliable design data for the selected materials in the instances where suitable data were not disclosed in the literature search phase. Over 1200 specimens were prepared and tested and 3500 test points evaluated at elevated temperature in appropriate atmosphere such as air, inert gas, or vacuum. Thermophysical, mechanical, and thermal aging stability properties were established for the conductor materials. Thermophysical, mechanical, thermal aging, and vacuum stability properties were established for electrical insulating materials in various forms. The forms included wire insulation, sheet material, molded insulation, encapsulation compounds, and interlaminar insulation. Typical applications for electrical conductor and electrical insulation materials are discussed and various materials are suggested for these applications. The recommended maximum operating temperature is presented along with the material properties which may limit the application. (auth)

46189 (NASA-TN-D-3483) MECHANICAL PROPERTIES OF DILUTE TUNGSTEN–RHENIUM ALLOYS. Klopp, William D.; Witzke, Walter R.; Raffo, Peter L. (National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center). Sept. 1966. 33p. CFSTI $2.00 cy, $0.50 mn.

Tungsten alloys containing 1.9 to 9.1 wt % Re and 1 to 7% Re were prepared by electron-beam and arc melting, respectively. These were warm fabricated into sheet and/or rod and evaluated by low-temperature bend and tensile studies, high-temperature tensile and creep studies, and recrystallization and grain growth studies. A commercial arc-melted 26% Re alloy and an electron-beam-melted 24% Re alloy were also evaluated for comparison. The dilute W–Re alloys were significantly more ductile than unalloyed W fabricated in a similar manner. Ductile-brittle bend transition temperatures of –75° and –100°F were observed for worked sheet of the electron-beam-melted alloys with 1.9 and 9.1% Re, respectively. The dilute arc-melted alloys were slightly less ductile than the electron-beam-melted alloys and room-temperature ductility was observed only with the 1.0% Re alloy. These compared with transition temperatures of 215° and 235°F for worked sheet of unalloyed arc- and electron-beam-melted W, respectively. Transition temperatures for the arc-melted 26% Re alloy and the electron-beam-melted 24% Re alloy were –150° and approximately –310°F, respectively. Annealing at 3600°F recrystallized all the alloys and significantly increased the bend transition temperatures. Minimums in transition temperature of 450° and 400°F occurred at 2% Re in the series of electron-beam-melted alloys and at about 4% Re in the arc-melted alloys, respectively, compared with 630° to 670°F for unalloyed tungsten. The 24 and 26% Re alloys, with transition temperatures of 375° and 350°F, respectively, were slightly more ductile than the best dilute alloys after this anneal. At 2500° to 3500°F, the short-time tensile strength increased with increasing Re content up to 9.1% Re. The

creep strength at 3500°F increased with increasing Re content up to 5 to 7% Re. The 24 and 26% Re alloys were weaker than the dilute alloys and had about the same creep strength as unalloyed W. (auth)

46190 (NP–16311) ISSLEDOVANIE PLASTICHNOSTI I PROCHNOSTI MONOKRISTALLOV BERILLIYA RAZLICHNOI CHISTOTY V TEMPERATURNOM INTERVALE 4,2–1100 DEG K. (The Study of Plasticity and Strength of Beryllium Monocrystals of Differing Purity in the 4.2-1100 Deg K Temperature Interval). Shubin, Yu. V. (Akademiya Nauk Ukrainskoi SSR, Kharkov. Fiziko-Tekhnicheskii Institut). 1964. 104p. Dep. mn.

Thesis.

A study was made of the plasticity and strength of Be monocrystals, 99.6% and 99.9% pure over a wide (4.2-1100°K) temperature region. A study was made of the literature covering the description of the processes of plastic deformation of metals and of the deformation and disruption of densely packed hexagonal crystals. The investigations deal with experimental methodology (production and testing of Be monocrystals), compressive deformation of crystals (in particular along the hexagonal [0001] axis), and temperature and orientation dependence of the slippage and disruption of Be monocrystals (99.9%) during dilation. Basic results of the paper were published earlier. (JPRS)

46191 (ORNL-P–2371) GRAIN BOUNDARY REACTIONS DURING DEFORMATION. Poteat, L. E.; Yust, C. S. (Oak Ridge National Lab., Tenn.). [1965]. Contract W-7405-eng-26. 16p. (CONF-660619–3). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 3rd International Materials Symposium on Ceramic Microstructure, Berkeley, Calif.

Microstructural observations on deformed ThO_2 and UO_2 specimens are discussed and related to their creep behavior. The creep data show that ThO_2 deformation exhibits three ranges, a brittle range at high strain rates, a viscous creep range at low strain rates, and an intermediate range. The microstructures produced in each of these ranges are shown. Results of grain boundary sliding experiments on UO_2 bicrystals are described, and mechanisms for formation of jogs and boundary cavities are discussed. It is concluded that some dislocation motion in the volume adjacent to the grain boundary is associated with the sliding process. (D.L.C.)

46192 (RFP–807) TRANSMISSION ELECTRON MICROSCOPY OF Pu–1 Ga. Brewer, A. W.; Fraikor, F. J. (Rocky Flats Div., Dow Chemical Co., Golden, Colo.). Aug. 1966. Contract AT(29-1)-1106. 7p. (CONF-660809–1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Microsymposium on Electron Microscopy, Walnut Creek, Calif.

An investigation of dislocations in Ga–Pu alloys is described. Rapid dislocation rearrangement and sub-boundary movement occurred upon exposure to the electron beam. After this initial movement, no further effect of thermal stresses was observed. It is concluded that transmission photomicrographs obtained in the investigation reveal a microstructure which is probably not indicative of that resulting from heat treating bulk Pu; however, they are a basis for further work. (J.R.D.)

46193 (WAPD-TM–528) A COMPILATION OF THE PROPERTIES OF HAFNIUM. Taylor, C. V.; Goodwin, J. G. (Bettis Atomic Power Lab., Pittsburgh, Pa.). Aug. 1966. Contract AT-11-1-GEN-14. 25p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Data on the physical, mechanical, and corrosion properties of Hf are compiled from current literature. Some data on the effects of irradiation on the properties of a Hf control rod after various stages of exposure are included. Most of the information is presented in the form of graphs. (13 references). (A.G.W.)

46194 (AD–634697) INFLUENCE OF IMPURITIES AND RARE-EARTH ELEMENTS ON THE PROPERTIES OF ALLOYS. Pridantsev, M. V. Translated from pp 1-208 of Vliyanie Primesei i Redkozemel'nykh Elementov na Svoistva Splavov, State Publishing House for Metallurgy, Science, and Technology, Moscow, 1962. 230p. (FTD-MT–64-295). CFSTI $6.00 cy, $1.25 mn.

Results of investigation of the influence of fusible-element impurities and additions of alkaline-earth and rare-earth elements on the properties of alloys are summarized. Properties studied include tensile and mechanical properties, oxidation and corrosion resistance, thermal fatigue resistance, electric conductivity and development of hot cracks. Alloys studied include many types of steels and Ni–Cr alloys. Data on properties of the impurities and the mechanism of their influence are included. (100 references). (A.G.W.)

46195 TUNGSTEN METALLIZING OF CERAMICS. Varadi, P. F.; Dominguez, Ramon (Machlett Labs., Inc., Stamford, Conn.). Amer. Ceram. Soc. Bull., 45: 789-91 (Sept. 1966).

Experiments were carried out to determine properties of W metallized ceramic joints. Pure W powder was successfully used to metallize 94% alumina bodies. Average bond strength of 12,000 lb/in.^{2} was achieved. The metallization was analyzed and no diffusion of W into the ceramic was found. (auth)

46196 DIFFUSION-CHEMICAL AND PHASE TRANSITION RESISTANCE IN CONDENSATION AND EVAPORATION OF ALKALI METALS. Subbotin, V. I.; Ivanovskii, M. N.; Milovanov, Yu. V. At. Energ. (USSR), 21: 17-22 (July 1966). (In Russian).

Evaporation (condensation) of alkali metals in the pressure range from 1 to 100 mm Hg was produced by emission (absorption) from the liquid surface both of monatomic and diatomic molecules. In the pressure range studied, the dimerization (dissociation) process of the molecules is the result of chemical reactions, occurring on the liquid surface. The condensation coefficients of monatomic and diatomic molecules are close to unity in the pressure range studied. (tr-auth)

46197 STUDY OF STRESS RELAXATION IN URANIUM. Tsvetaev, A. A.; Bovenko, V. N.; Golovanov, Yu. N. (Inst. of Physical Chemistry, Moscow). Fiz.-Khim. Mekh. Mater., 2: 266-71(1966). (In Russian).

Quenched, recrystallized and annealed (6 hr at 620°C) specimens of U were investigated for stress relaxation during heating and bending. It was established that the relaxation resistance of U decreases with increasing temperature when investigated within the range of temperatures from 300 to 900°C. Compared with the annealed specimens, quenched (900°C in water) and deformed specimens displayed greater stress relaxation following the removal of a stress load of 4 kg/mm^2; this may be attributable to the increase in the degree of nonuniformity of the metal owing to the presence of excess point defects. It was established that: 1) stress relaxation due to the presence of excess vacancies (vacancies in excess of equilibrium concentration of the crystal) is of a damping character; 2) as the concentration of excess vacancies increases, the degree of relaxation increases also; 3) as the free path of migration of vacancies increases, the degree of relaxation decreases; 4) this reasoning is fairly universal in the sense that it also applies to other mobile defects (interstitial atoms, vacancy complexes, etc.). The activation energy of the relaxation process in the unsteady-state stage of annealed U is calculated at 0.87 ev. (J.P.R.S.)

46198 INFLUENCE OF A VACUUM ON THE HIGH-TEMPERATURE CREEP OF BETA ZIRCONIUM. Abromyan, E. A.; Ivanov, L. I.; Kudryatsev, N. S.; Yanushkevich, V. A. (Baikov Inst. of Metallurgy, Academy of Sciences, USSR). Fiz.-Khim. Mekh, Mater., No. 4, 422-3(July–Aug. 1966). (In Russian).

Influence of a vacuum (10^{-6}–10^{-1} mm Hg) on creep rate and long-time strength of Nb and Zr at 1100–1300°C and stresses ranging from 5 to 30 kg/cm^2 was studied. Testing samples in a vacuum of 10^{-5} mm Hg at 1200°C showed that

creep rate remains constant for more than 10 hours, no fracturing is evident and the sample is very ductile. If the vacuum is changed to 10^{-4} mm Hg the creep rate is continuously diminished. Ductility of Zr drops off along with its long-time strength and a sample will fail in a very short time. The dislocation mechanism of high-temperature creep for pure bcc metals is discussed. (J.P.R.S.)

46199 PHASE DIAGRAM OF THE SYSTEM Zr–Fe–B. Kuz'ma, Yu. B.; Lakh, V. I.; Voroshilov, Yu. V.; Stadnyk, B. I.; Markiv, V. Ya. Izv. Akad. Nauk SSSR, Metal., No. 6, 127-9(Nov.-Dec. 1965). (In Russian).

The phase diagram for the system Zr–Fe–B at 850C was investigated by x-ray analysis. The specimens were prepared from Fe and ZrB_2 at 1600C. A total of 72 different specimens was studied, and the experimental results are presented graphically. In addition, the crystal structure of the compound Zr_2Fe was determined. It was found that the structure of Zr_2Fe is of the Ti_2Ni type with a = 12.14 Å. (ATD)

46200 SOLID STATE SOLUBILITY OF ZIRCONIUM IN ALUMINUM. Zamotorin, M. I.; Zamotorina, T. M. Izv. Akad. Nauk SSSR, Metal., No. 6, 130-1(Nov.-Dec. 1965). (In Russian).

The solid state solubility of Zr in Al was investigated. The solubility was determined by means of thermal, dilatometric, x-ray, microhardness, and electrical resistance analysis. The experimental results are presented graphically. (M.O.W.)

46201 INVESTIGATION OF THE OXIDATION OF TUNGSTEN–NIOBIUM ALLOYS. Lazareva, I. Yu.; Prokoshkin, D. A.; Vasil'eva, E. V. Izv. Akad. Nauk SSSR, Metal., No. 6, 161-7(Nov.-Dec. 1965). (In Russian).

The effect of alloying W with Nb on the oxidation properties of W was investigated. The oxidation kinetics and x-ray spectra of the formed oxides of W–Nb alloys containing 1—50 wt % Nb were studied at 900, 1000, 1100, 1200 and 1300C. The experimental results are summarized in graphs and tables. The alloy containing 30 wt % Nb had the greatest resistance toward oxidation. It is concluded that the beneficial effect of the addition of Nb to W results from the formation of phases which exhibit stronger interatomic bonds and from the character of the oxide scale and subscale. (ATD)

46202 AUTORADIOGRAPHS IN PYROLYTIC GRAPHITE. Hammond, Martin L. (Lockheed Research Lab., Palo Alto, Calif.). J. Appl. Phys., 37: 4298-9(Oct. 1966).

Autoradiographic studies of metal diffusion in pyrolytic graphite are reviewed, and a mechanism by which the results may be explained is considered. It is suggested that diffusion perpendicular to the deposition plane takes place at approximately the same rate macroscopically over the entire surface of the specimen; however, because of the curvature of the basal planes within the major cones, there is an additional lateral component due to diffusion parallel to this curvature and down the overall concentration gradient. (A.G.W.)

46203 ROLE OF STRESSES IN THE $\alpha \rightleftharpoons \beta$ TRANSFORMATION OF Pu. Spriet, B. (CEN, Fontenay-aux-Roses, France). Mem. Sci. Rev. Met., 63: 563-70(June 1966). (In French).

The manner in which the normal and tangential components of stresses can affect the $\alpha \rightleftharpoons \beta$ transformation of Pu was studied. Both internal (mechanical and crystallographic) and applied (hydrostatic pressure and uniaxial compression or stress) are considered. An approximate evaluation of the transformation stresses created by the volume variation accompanying a phase change is first given. The role of stresses on the transition temperature and the kinetics of the $\alpha \rightleftharpoons \beta$ transformation is shown. The characteristics of the two inverse transformations can be explained by the very different mechanical properties of the two phases and by the particular nature of each transformation (mechanism by shearing or by diffusion). The hydrostatic stresses have the effect of displacing the transition temperature by the Clapeyron relation. The nonhydrostatic stresses do not affect the transformation occurring by diffusion; on the contrary the tangential component of these stresses can favor the shearing mechanism of the $\beta \rightarrow \alpha$ transformation. The significance of the $\underline{p}$ factor in the Avrami equation modified by the presence of stresses was discussed from the kinetic viewpoint. This term represents the action of stresses on the germination velocity. When $\underline{p}$ is negative the hydrostatic stresses delay the reaction by increasing the free energy of formation of the grain. On the contrary the kinetics are accelerated by the nonhydrostatic stresses. (J.S.R.)

46204 DETERMINATION OF THE SURFACE ANALYTICAL ALTERATIONS OF STEELS BY MEANS OF THE MICROANALYZER WITH ELECTRONIC PROBE. Castro, R.; Lefevre, J. (Laboratoire de Recherches, Savoie, France). Mem. Sci. Rev. Met., 63: 571-3(June 1966). (In French).

The use of the electronic probe microanalyzer for the study of the surface alterations occurring in steels during thermal treatment was considered. Two methods of measurement were described: exploration in sections of the sample and analysis made at the surface of the sample using an electron beam with variable energy and penetration. The application of these two methods is described. These methods give a direct and nondestructive means for determining the surface analytical alterations of metals in a layer less than 1 μ. (J.S.R.)

46205 PHYSICAL METALLURGY AND MECHANICAL CHARACTERISTICS OF Ti–Nb ALLOYS. Brown, A. R. G.; Jepson, K. A. Mem. Sci. Rev. Met., 63: 575-84(June 1966). (In French).

Ti–Nb alloys with 5, 10, 15, 20, and 25 at. % Nb were prepared and their physical and mechanical characteristics were determined. The electrical resistance, temperature of the M_s points and the $\beta \rightarrow \alpha + \beta$ transformations were measured. The M_s and the structure of the martensite phase were determined. Hardening of the alloys and the effect of aging on the structure was studied. The alloys with 10 and 15 at. % Nb had good mechanical resistance and ductility. (J.S.R.)

46206 METALS AND ALLOYS FOR VERY HIGH TEMPERATURES. Morton, P. H.; McQuillan, M. K. (Imperial Metal Industries (Kynoch), Ltd., Birmingham, Eng.). Mem. Sci. Rev. Met., 63: 585-92(June 1966). (In French).

The development of Nb, Ta, and W alloys that can be used both at room temperatures and high temperatures without significant modification of their machinability is discussed. The covering used for Nb alloys is described. The development of alloys and claddings for high temperature use is considered. (J.S.R.)

46207 NEW TRENDS IN METHODOLOGIES OF STUDY ON HEAT-RESISTING ALLOYS. Brozzo, P. (Centro Sperimentale Metallurgico, Genoa). Met. Ital., 58: 227-45(July 1966). (In Italian).

Possibilities arising from present knowledge of the correlation of creep data of metallic materials were examined. It is concluded that it is possible to subdivide heat-resisting alloys into various classes, to which different testing methods must be applied. Each of these classes shows well defined and clearly identifiable metallurgical characteristics upon which depend the proper treatment of experimental results. Every heat-resisting material investigated to date may be included in one of the following groups: simple materials (pure metals and those commercial alloys that under particular conditions behave as pure metals), complex materials with stable structure (alloys whose creep strength is due only to atoms in solid solution or those strengthened by the presence of precipitates whose nature, form, and distribution produce effects almost time-invariable), complex materials with unstable structure (materials whose creep strength is influenced in a time-variable amount by phenomena of precipitation and

agglomeration of the precipitates). For each of these groups, the proper methods of testing and interpretation of experimental data are described and discussed. (auth)

46208 PROPERTIES OF ALLOYED NICKEL–BERYLLIUM SYSTEMS. Borisov, V. A.; Rakhshtadt, A. G.; Shpitsbery, A. L. (Moscow Technical Inst.). Metalloved. Term. Obrabotka Metal, No. 6, 12-16(June 1966). (In Russian).

The alloying of spring alloys of Ni–Be with Mo, Mo, and Bo, W, and V increases the resistance to small plastic deformations. Hardening of the Ni–Be alloy alloyed with Mo, W, or V was explained by the precipitation of a large quantity of particles of the β' phase because of the reduction of the solubility of Be in the Ni solid solution. The addition of Co leads to a reduction of the specific electroresistivity of the alloys in comparison with that of Ni–Be alloys. The alloying of Ni–Be alloys with Mo and B, or with W, or V increases the thermal stability of the alloys. (tr-auth)

46209 PROPERTIES OF WC–TiC–10 PERCENT Co ALLOYS IN CONNECTION WITH THE CARBON CONTENT OF CARBIDES. Suzuki, Hisashi; Hayashi, Kozi; Kawakatsu, Ichiro (Tokyo Univ.). Nippon Kinzoku Gakkaishi, 30: 689-93(1966). (In Japanese).

The effect of C content on the properties of WC–TiC–10% Co alloys containing a large amount of TiC, such as the width of ($WC + \beta + \gamma$) 3-phase range, lattice constants of β and γ-phase, magnetic saturation, transverse-rupture strength, etc., were investigated. WC–TiC–10% Co alloys containing up to 25% TiC and with various C contents in each 3-phase range were vacuum sintered at 1400°C for 1 hr. It was found that the lattice constant of β phase varies regularly in the 3-phase range with the change of C content. This behavior may be accepted, because the C content of the β phase changes widely towards C deficiency. The lattice constant of the γ phase also varies regularly with the C content in the phase range. This change is due to the variation of the dissolved W content in the binder, and seems to have no relation with Ti because Ti scarcely dissolves in the binder in this case. Both β- and γ-phase lattice constants vary only inside the 3-phase range in close connection with each other, but the value of the β or γ phase becomes constant in both deficient and excess C phase ranges neighboring the 3-phase range. In the low- and high-C range, the constant values of the β phase are 4.314 ± 0.001 Å and 4.321 ± 0.001 Å, respectively, and those of the γ phase coincide with those of WC–10% Co alloys. The width of the 3-phase range increases with TiC. This is attributable to the change of the C content of the β phase in equilibrium with the γ phase. The position of the stoichiometric C content of alloys with high TiC is found in the free-C precipitation range. The strength of the alloys decreases with increasing TiC content and a maximum strength is obtained in the high-carbon 3-phase alloys. Other properties show the regular changes in the 3-phase range. (auth)

46210 MICROPROBE STUDIES OF THERMALLY-INDUCED REACTIONS IN NUCLEAR FUEL MATERIALS. Zelezny, William F. (Phillips Petroleum Co., Idaho Falls, Idaho). Nucl. Appl., 2: 239-45(June 1966).

The electron microprobe analyzer was applied to a study of chemical reactions and diffusion in a number of nuclear fuel materials. During manufacture by powder metallurgy techniques, UN fuel particles underwent complete chemical reaction with the Al matrix in which they were embedded, while U_3Si and UC fuel particles showed partial chemical reaction. Subsequent heating completed the U_3Si–Al and UC–Al reactions. Diffusion was observed to have taken place across the boundaries in UO_2–ZrO_2 couples after exposure to elevated temperatures. (auth)

46211 AMORPHOUS SELENIUM THERMAL CONDUCTIVITY STUDY IN SOFTENING REGION. Abdullaev, G. B.; Mekhtieva, S. I.; Abdinov, D. Sh.; Aliev, G. M. (Inst. of Physics, Baku). Phys. Lett., 23: 215-16(Oct. 17, 1966).

The results of the effects of electronic irradiation (3 Mev, 5μA), as well as admixtures of Cd, P, and Mn on thermal conductivity are presented for amorphous Se, within the temperature range of 15 to 45°C. (auth)

46212 PARTICLE SIZE OF SUBMICRON TUNGSTEN AND TUNGSTEN CARBIDE POWDERS. Miyoshi, A.; Doi, Y. Sumitomo Denki, No. 85, 73-81(July 1964). (In Japanese).

In order to control the size of submicron grains in WC–Co alloy, the relation between the morphological properties of W powders and the properties of WO_3, H_2WO_4, $3(NH_4)_2O \cdot 12WO_3 \cdot 5H_2O$, and the transition of particle sizes after the reaction $W + C \rightarrow WC$, were studied by measuring the particle size by permeability, gas absorption, x-rays, the apparent and tap density, and electron microscopy. The particle size of WC powders is subject to the size of unit particles of W powders, either when the W powders are the weak aggregates that are easily broken into dispersed unit particles or when they are the strongly sintered aggregates of unit powders. The WC grain size of WC–Co alloy is subject to the size of WC powders measured by the permeability or the gas absorption methods, if grain growth does not occur during sintering. (auth)

46213 TREATMENT OF A NICKEL MELT BY MAGNESIUM, CERIUM, AND ZIRCONIUM ADDITIONS. Volkogon, G. M. Tsvetn. Metal., No. 6, 85-8(June 1966). (In Russian).

The effect of the residual additive concentration on the plasticity of Ni was investigated, using a low-frequency induction furnace for preparing the melts and for deoxidizing the Ni by means of C or C + Su + Si, keeping the liquid metal at 1550°C. Hot-forged specimens were used to study the effect of residual additives. It was found that the plasticity is dependent not only on the added material but also on the soaking period. Addition of Ce, Mg, and Zr exerted a strong refining effect, reducing markedly the concentration of harmful impurities, gases, and nonmetallic occlusions. Large residual amounts of these elements were found to form an independent phase at the grain boundary, increasing the brittleness of the alloy. The surface of the castings was clean and free from cracks and pores. The plasticity of Ni foils treated with Mg decreased rapidly in the intermediate temperature range; treatment with Ce and Zr resulted in an increase of the plasticity with increasing temperature. Best results were obtained by adding the alloying agent at 1550°C at a rate of 0.1% and soaking the mixture for 6 minutes after the addition. (TTT)

46214 CHEMICAL PROPERTIES OF LANTHANUM GERMANIDES. Lyutaya, M. D.; Goncharuk, A. B. (Inst. of Problems in the Science of Materials, Academy of Sciences, Ukrainian SSR). Ukr. Khim. Zh., 32: 433-6 (1966). (In Russian).

The chemical properties of $LaGe_2$, LaGe, and La_5Ge_3 were studied at room temperature in air and in water, and the thermal stabilities of these compounds were studied in air and in an NH_3 atmosphere. The lanthanum germanides used in the study were synthesized from La and Ge in an arc furnace. Interaction between the germanides and water was determined from the quantity of water passing into solution with decomposition of the lanthanum germanides. Powdered materials with particles measuring 40 to 50 μ were used for studying the thermal stability. A sample of the powder was held at a given temperature for a specific length of time and the oxidation products were then subjected to chemical analysis. Specimens of the three compounds were interacted with NH_3 at temperatures of 500 to 700°C, and the products of the reaction were then chemically analyzed. The experimental data are tabulated. It was found that $LaGe_2$ is easily decomposed by moisture while LaGe and La_5Ge_3 are practically stable in water. There was a direct relation between the composition of the lanthanum germanides and their stability in air and in NH_3. LaG_2 was more resistant to atmospheric oxidation at 200 to 400°C and to interaction with NH_3 at 500 to 700°C than were LaGe and La_5Ge_3 under the same conditions. Intermediate compounds, lanthanum hydroxygerma-

nides, were formed in the germanide oxidation process. A compound with the empirical formula LaGeN was produced by interactions between LaGe and NH_3 at 500 to 700°C. La_5Ge_3 interacted with NH_3 in this temperature range. (ATD)

46215 ON THE MIXED CRYSTAL SYSTEM SCANDIUM OXIDE–INDIUM OXIDE. Petru, F.; Hajek, B.; Kalalova, E.; Dolezalova, J. (Inst. of Inorganic Chemistry, Prague). Z. Chem., 6: 190(May 1966). (In German).

Both oxides were mixed in definite ratios and dissolved in dilute H_2SO_4; the hydroxides were precipitated with NH_3, filtered, washed, and heated in a Pt crucible 7-9 hours at 920–940°C. Debye-Scherrer patterns were then recorded; intensity diagrams for 0%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, and 100% Sc_2O_3 are illustrated. Both oxides crystallize in the same lattice type (Tl_2O_3 type, space group I a 3), and the ionic radii of the metals differ only slightly. Thus a series of mixed crystals is found. The lattice constant a is shown to be a linear function of the composition of the mixed phase, following the rule of Vegard. For In_2O_3, a = 10.09 kX; for Sc_2O_3, a = 9.85 kX, with no deviation for intermediate points from the line. Therefore a continuous series of solid solutions is formed. (BBB)

46216 DETERMINATION OF THE COEFFICIENT OF CARBON DIFFUSION IN ZIRCONIUM CARBIDE AT HIGH TEMPERATURE. Gert, L. M.; Babad-Zakhryapin, A. A. Zavodsk. Lab., 32: 970-3(1966). (In Russian).

A formula was obtained for computing the coefficients of C diffusion in zirconium carbide produced by Zr condensation on graphite surface heated to 1650 to 2000°C. The diffusion coefficient as a function of temperature is expressed by $D = 5 \times 10^2 \exp(79{,}000/RT)$. (R.V.J.)

46217 CONTRIBUTION TO A STUDY OF THE DEFORMATION OF BERYLLIUM AT A HYDROSTATIC PRESSURE OF 15 KILOBARS. Carpentier, D.; Contre, M.; Daumas, R.; Rech, J. P.; Francois, D. (Commissariat a l'Energie Atomique, Paris). 21p. (In French). (CONF-660205-7). ORAU, Gmelin, AED-CONF-66-021-9.

From Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers, New York.

Fracture tests were made on polycrystalline Be at hydrostatic pressure between 1 and 15 kilobars. The samples broke at a pressure $\leq$5.5 kilobars showing a transgranular fragile fracture analogous to that observed at normal pressures. The samples fractured at higher pressures show a ductile fibrous fracture. A discontinuity in the elongation curve at the rupture pressure remains unexplainable. Some microscopic observations were included. (tr-auth)

46218 REFRACTORY MATERIAL. Carpenter, Frederick D.; Yang, Ling (to General Dynamics Corp.). U. S. Patent 3,264,222. Aug. 2, 1966. Filed Mar. 26, 1962.

A method of in situ preparation of refraction metal carbides in O_2-free atmospheres by reaction of C and metal is described. High pressures are used during the C–metal reactions and during densification of the product. The process produces a gas permeability-reducing high-temperature bonding agent. A heat-decomposable compound is added to the carbide which yields a non-oxidizing gas during decomposition. (J.R.D.)

46219 METALLURGY. Torti, Maurice L. Jr. (to National Research Corp.). U. S. Patent 3,268,328. Aug. 23, 1966. Filed Nov. 3, 1964.

A method is described for production of fine-grained Ta and Ta alloys which are resistant to grain growth at elevated temperatures. This is achieved by adding small but effective amounts of Y and lanthanides. (J.R.D.)

Radiation Effects

See also CHEMISTRY — Radiation Chemistry

Refer also to abstracts 46193, 46211, 46539, 46540, 46598, 46944, 46950, 46955, and 46956.

46220 (AECL–2571) SAP CLAD URANIUM CARBIDE FUEL ELEMENTS. MacDonald, R. D.; Mathers, W. G.; Tachis, A. M.; May, J. E. (Atomic Energy of Canada Ltd., Chalk River (Ontario)). May 1966. 82p. Dep. mn. AECL $2.00.

Ten SAP-sheathed UC elements, with Ar filling-gas, were irradiated at linear power ratings up to 1040 w/cm, in the organic-cooled loop of NRX. The composition of the arc-cast 14.0 mm diameter pellets varied from 4.6 to 4.8 wt % C. Each element contained six UC pellets in a finned SAP tube. Fuel burnups ranged from 3450 to 11,100 Mwd/t U. Two elements had central thermocouples; in the hottest element the measured central temperature was 1620°C at the start of the irradiation, but decreased to 1020°C at the end. This decreasing temperature was attributed to increasing fuel-to-sheath heat conductance across the argon-filled gap because of the fuel swelling. The irradiation was stopped when the sheath of the element with the highest burnup split between fins. The failure was probably caused by the expanding fuel over-straining the SAP. Isolated reaction between the fuel and sheath was observed, but the maximum penetration of the SAP was only 0.03 mm. The UC pellets had residual diametral expansions up to 1.5% while the maximum decrease in UC density was 6%. The isotropic swelling of the fuel was generally consistent with other published results. Irradiation-induced porosity, both within grains and at boundaries, was more plentiful from the pellet mid-radius inwards. Before irradiation free U was observed throughout hypostoichiometric pellets, predominantly in grain boundaries. Afterwards, much of this U was in grain boundaries near the periphery. In most pellets containing <4.65 wt % C, U had migrated to the end-dishing between pellets and to axial holes containing the thermocouples. Grain boundary movement was found in several pellets: small pores marked the new locations of boundaries and larger pores outlined the earlier positions. The percentage of fission gas released increased with fuel temperature, but appeared independent of carbon content. The maximum release was 1.4%. (auth)

46221 (BMI–1782) COMPARISON OF THE RADIATION STABILITY OF UO_2–ZrO_2 WITH THAT OF UO_2 AND UO_2–BeO. Saling, James H.; Wright, Thomas R.; Fromm, Earle O. (Battelle Memorial Inst., Columbus, Ohio). Aug. 15, 1966. Contract W-7405-eng-92. 43p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The radiation stability of UO_2–29.9 wt % ZrO_2 was compared with that of bulk UO_2 and UO_2–29.4 wt % BeO dispersions at surface temperatures from 770 to 950°C and at burnups ranging from 12.4 to 14.8×10^{20} fissions per cm^3. Dimension and density measurements indicated that the UO_2–ZrO_2 fuel swelled more than the UO_2 or UO_2–BeO fuels. Significant microstructural changes were some mutual solubility of the UO_2 and BeO at the lowest irradiation temperature, evidence of the initiation of a columnar grain structure in the UO_2–ZrO_2, evidence of a reaction between the UO_2–ZrO_2 and the Hastelloy X cladding, and corrosion of the Hastelloy X cladding by Na. X-ray-diffraction and metallographic studies indicated that the central regions of the UO_2–ZrO_2 had transformed from a multiphase to a single-phase cubic structure. Under the test conditions described, the radiation stability of the UO_2–ZrO_2 did not compare favorably with that of either the UO_2 or the UO_2–BeO. (auth)

46222 (BNL–10521) STUDIES ON A FUEL FOR AN ORDERED BED REACTOR. Pancer, G. P.; Holden, R. B.; Gurinsky, D. H. (Brookhaven National Lab., Upton, N. Y.). [nd]. Contract AT(30-2)-Gen-16. 22p. (CONF-661003-5). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From AIME Nuclear Metallurgy Symposium on High Temperature Nuclear Fuels, Delevan, Wis.

The irradiation behavior of a low density (85% T.D.) UO_2–SS cermet fuel for a fast breeder reactor concept was investigated. The effects of thermal stress and burnup were determined at burnups as high as 3.8% and thermal stresses as high as 37,000 psi. No cracking and only small dimensional changes were noted in the irradiated fuel pellets. (auth)

46223 (BNL–10543) THE INFLUENCE OF RADIATION ON METALLURGICAL PROCESSES. Dienes, G. J. (Brookhaven National Lab., Upton, N. Y.). [1966]. Contract AT(30-2)-Gen-16. 58p. (CONF-660923–1). Dep. mn. CFSTI $3.00 cy, $0.50 mn.

From Solid State Conference on Interaction of Radiation with Solids, Cairo, Egypt.

The processes that take place when various radiations impinge on solids are summarized. Particular attention is given to enhanced diffusion and defect trapping in metals and nonmetals. The theory is reviewed, and some representative experiments are discussed. Metallurgical reactions resulting from enhanced diffusion coefficients are pointed out. (62 references.) (A.G.W.)

46224 (BNL–10560) PHYSICAL PROPERTIES OF IRRADIATED CERAMIC MATERIALS. Levy, Paul W. (Brookhaven National Lab., Upton, N. Y.). [1964]. Contract AT-30-2-GEN-16. 12p. (CONF-660505–12). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From American Ceramic Society Meeting, Washington, D. C.

The effects of radiation on certain properties of a small number of ceramic materials chosen to demonstrate the more important basic radiation processes are discussed. The materials were chosen to emphasize the difference between the ionizing processes and the atomic displacement processes that occur in reactor radiation fields. Point defects are illustrated by formation of color centers in fused silica. The effect of fast neutron irradiation on the low-temperature thermal conductivity of single-crystal Al_2O_3 is described as an example of the spike or Wigner region. Irradiation-induced dimensional changes in crystal quartz and fused or glassy silica are cited as an example of macroscopic radiation effects. Radiation effects on diffusion of atoms in a solid are discussed briefly. (A.G.W.)

46225 (BNWL–238) THE EFFECTS OF IRRADIATION, COLD WORK, AND ANNEALING ON THE MARTENSITE CONTENT OF TWO AUSTENITIC STAINLESS STEELS. Carter, J. W. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). Aug. 1966. Contract AT(45-1)-1830. 22p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

An investigation of the effects of cold work, thermal exposure, chemical composition, and neutron irradiation on the deformation-induced martensitic transformation in AISI 304 and 348 SS is reported. One experiment was conducted to investigate the relationship between the fluctuations in tensile strength and in martensite content of AISI 304 and 348 SS with 300°C water exposure for extended periods of time. In another experiment the relationship between cold work and martensite content and the effect of annealing on this relationship were studied, and in a third experiment, the effect of irradiation on martensite content and on strain energy requirements for martensite formation were investigated. (J.R.D.)

46226 (BNWL-SA–791) THE IRRADIATION BEHAVIOR OF UO_2–PuO_2 FUELS IN PRTR. Freshley, M. D.; Panisko, F. E.; Skavdahl, R. E. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). July 22, 1966. Contract AT(45-1)-1830. 29p. (CONF-661003–4). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From AIME Nuclear Metallurgy Symposium on High Temperature Nuclear Fuels, Delevan, Wis.

Vibrationally compacted UO_2-PuO_2 fuel structures change dramatically under the irradiation conditions expected during the Batch Core Experiment, i.e., maximum rod powers of 20 kw/ft with centerline fuel temperatures near melting. Under molten core conditions, the physical behavior of vibrationally compacted fuel varies noticeably, even in like rods exposed to nominally the same conditions. Melting in vibrationally compacted UO_2-2 wt % PuO_2 fuel commences at a linear rod power of 20-21 kw/ft. Melting is evidenced by the formation, on cooling, of a well-defined cellular structure in the thermal center of the fuel rod. Melting usually results in axial fuel relocation. Although the defect behavior of vibrationally compacted UO_2-PuO_2 fuel rods has been excellent at lower power generations (i.e., up to ~24 kw/ft), a "rupture threshold" may have been experienced at high power generations (in the neighborhood of 27 kw/ft). Behavioral differences in such phenomena as fuel oxidation have been indicated between nondefected and defected UO_2-PuO_2 fuel rods. Fission gas release values as high as 88% have been measured in vibrationally compacted UO_2-PuO_2 fuel rods that were operated with volumetric average fuel temperatures of approximately 2200°C. (auth)

46227 (LA–3557) THE IRRADIATION OF LIQUID PLUTONIUM FUELS IN A THERMAL REACTOR. Cubitt, Richard L.; Ragan, George L.; Kirkpatrick, Donald C. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). Apr. 1966. Contract W-7405-eng-36. 30p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

In-pile test loops for irradiating liquid Pu fuel alloys were designed and operated in the Omega West Reactor. These loops provide a Na environment for test fuel capsules at temperatures corresponding to those expected for LMBFR. Seven fuel capsules were irradiated with up to 2% burnup of Pu. Irradiation of two fuel specimens is currently in progress. The design, construction, and operation of the irradiation loops are described along with handling of the irradiated test fuel capsules. (auth)

46228 (NRL–6415) DAMAGING NEUTRON EXPOSURE CRITERIA FOR EVALUATING THE EMBRITTLEMENT OF REACTOR PRESSURE VESSEL STEELS IN DIFFERENT NEUTRON SPECTRA. Serpan, C. Z. Jr.; Steele, L. E. (Naval Research Lab., Washington, D. C.). July 28, 1966. Contract AT(49-5)-2110. 28p. (CONF-660607–3). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From 3rd International Symposium on the Effects of Irradiation on Structural Metals, Atlantic City.

Data and information on radioinduced nil-ductility temperature increases in pressure vessel steels such as A-212 B, A-302 B, and A350-LF1 are presented. Results of the investigation indicate that properties of steels irradiated near the core of pressurized light water moderated reactors can be intercompared for engineering uses assuming a fission spectrum and accounting for neutrons of energies >1 Mev. However, calculated spectra and average cross section adjustment to an energy limit as low as >0.183 Mev must be applied to data from highly moderated reactors. (J.R.D.)

46229 (UCRL–70022) ELECTRICAL PROPERTIES OF DIELECTRIC LIQUIDS IN A RADIATION FIELD. Slack, Don S. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 15, 1966. Contract W-7405-eng-48. 11p. (CONF-661016–14). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

Experiments were conducted to determine changes, transient and permanent, in the electrical properties of various liquids when irradiated. The liquids tested were irradiated using the Astron accelerator beam pulse intensities of 3.3×10^7 R/sec and doses of 2 to 5×10^5 R/sec and a Ta target to provide bremsstrahlung. The materials studied included: perfluorocyclicbutylamines, trichlorotrifluoroethane, trichloropentafluoropropane, chlorotrifluoroethylene, various petroleum products, a synthetic hydrocarbon, and a pure fluorocarbon. Conductivity increased during and a short time after the pulse. Transient conductivity of all liquids tested behaved similarly, and varied less than an order of magnitude. Maximum transient conductivity increase was about 2×10^{-10} mho-cm. Breakdown voltage was not greatly reduced by permanent radiation damage at the doses used, nor by the transient effects of the pulsed radiation used. (P.C.H.)

46230 EVALUATION OF TEMPERATURE FIELD CAUSED BY NUCLEAR RADIATION BY USE OF DIMENSIONAL ANALYSIS. Zdravkovic, M. Atomkerenergie, 11: 379-80(1966). (In German).

Methods associated with the similarity theory are used to obtain the dimensionless physical quantities which describe the constant stationary temperature field radioinduced in samples of materials being tested. The maximum

temperature and its position in the sample are basic temperature field characteristics. Dimensionless quantities are obtained for irradiation intensity, average neutron diffusion length, and thermophysical properties and geometry of the sample material. The functional connection among these quantities is represented by universal diagrams. The position and magnitude of the highest temperature in the sample may be obtained directly from the diagrams for predetermined irradiations of samples whose characteristics and geometrical shapes are known. Using this method, results that can be analyzed only through experiment may be generalized, and values may be derived which are not obtained by experiment. (J.R.D.)

46231 EXAMINATION OF THE RADIATION BEHAVIOR OF FUEL ELEMENTS IN THE RCN. Sens, P. F. Atoomenergie Haar Toepass., 8: 158-68(July 1966). (In Dutch).

The results of an investigation concerning the radiation behavior of fuel elements in the Petten nuclear power plant are reported. The fuel elements examined were the experimental fuel elements of the NERO ship reactor. (tr-auth)

46232 RADIATION-RESISTANT LUBRICATING GREASES BASED ON SODIUM TEREPHTHALAMATE. Makeeva, E. D.; Makhnenko, G. Kh.; Zaslavskii, Yu. S. Khim. Tekhnol. Topliv Masel, No. 6, 24-7(1966). (In Russian).

Lubricating greases prepared by the thickening of mineral oils and synthetic liquids with terephthalamates, which are asymmetric derivatives of terephthalic acid, exhibit high radiation resistance, high water repellency, and good structural strength and adhesion to rubbing surfaces above 200°C. Sodium terephthalamate-base lubricating greases were prepared in two steps: synthesis of sodium terephthalamate, and preparation of greases from mineral oils, synthetic hydrocarbon oil, and polymethylphenylsiloxane liquid. The thickener concentration varied from 8 to 14%. The preparative procedure of the greases is described. Studies of the properties of the greases showed that they melt at 200 to 245°C; the thickening capacity of sodium terephthalamate and the colloidal stability of the greases can be further improved by using a sodium terephthalamate-sodium benzoate complex (molar ratio: 1/0.5); and the basic physiochemical properties of terephthalamate greases are not substantially impaired by γ doses of 10^8 rad. (ATD)

46233 EFFECT OF GAMMA RADIATION ON CERTAIN EPOXY RESINS. Sorokin, M. F.; Lyalyushko, K. A.; Tang, Tsung-lan. Lakokrasochnye Mater. ikh Primenenie, No. 2, 1-5(1965). (In Russian).

A study was made of the effect of γ radiation on the properties of certain epoxy resins and the effect of certain hardeners on the radiation resistance of the epoxy coatings. The resins used were based on epichlorhydrin and 2,2-bis(4-hydroxyphenyl)-propane or -butane, or 1,1-bis(4-hydroxyphenyl) cyclohexane. The resins were irradiated using a ^{60}Co source in glass test tubes and changes in solubility in organic solvents, melting point, glycidyl group content, molecular weight, intrinsic viscosity, polydispersity, and weight loss at 250°C were determined. The data are presented in graphic and tabular form. It was found that at doses up to 100 Mrad, these properties remain virtually unchanged. When the dose is raised to 775 Mrad, the glycidyl group content decreases linearly and the molecular weight and intrinsic viscosity increase logarithmically with increasing dose. The mechanical properties and gas permeability of coatings of the same resins were tested in the presence of such hardeners as m-phenylenediamine, 4,4′-diaminodiphenylmethane, hexamethylenediamine, and a polyamide resin. The data, given in tabular form, indicate that the films show good radiation resistance and are suitable as radiation-resistant coatings. (ATD)

46234 RADIATION-DAMAGE EFFECTS IN BORATED GRAPHITE. Davidson, J. M.; Gates, L. O.; Nightingale, R. E. Nucl. Sci. Eng., 26: 90-8(Sept. 1966).

Radiation effects were determined in samples of borated graphite used as a neutron shield in the Enrico Fermi Power Plant. The material nominally contained 5 or 7 wt% Boron as B_4C particles in a nuclear-graphite matrix. The graphite from the center of the graphitizing furnace had a shiny, grey appearance. Microscopy studies showed that the boron carbide had melted and the graphite particles were recrystallized. The remaining material had the usual dull black appearance of nuclear graphite. Most irradiation tests were conducted at 370 and 500°C to a total thermal-neutron dose of 2.5×10^{21} n/cm^2 in a predominantly thermal-neutron spectrum. Dimensional changes and other radiation effects were much larger than those in nonborated materials. One grey sample expanded 3.3%, but dimensional changes and other property changes in the black materials were generally less. The radiation effects were attributed primarily to carbon-atom displacements caused by the energetic Li and He atoms in the $^{10}B(n,a)^7Li$ reaction. The faster rate of damage in the grey material is believed to have been due to the finer dispersion of B in the matrix. This finer dispersion would allow more of the He and Li atoms to escape from the B_4C particles and produce carbon-atom displacements. Preliminary tests in a neutron spectrum, where the ratio of thermal-to-fast neutrons was less than 1% of that in the flux utilized in the above experiments, produced much smaller changes for comparable fast-neutron doses. This is further evidence that most damage is caused by thermal neutrons. (auth)

46235 PHOTOSENSITIVITY OF MoO_3 SINGLE CRYSTALS. Shkolnik, A. L. Soobshch. Akad. Nauk Gruz. SSR, 39: 295-7(1965). (In Russian).

The effects of radiations on the photosensitivity of MoO_3 single crystals were investigated, and possible causes proposed. The photosensitivity of single crystals of MoO_3 was measured over a temperature range from 220 to 400°K before and after irradiation with: x rays, using RUP-200-20-4 equipment; γ rays, using a Ra–Be source, and neutrons, in a nuclear reactor. X radiation had little effect on the photosensitivity; γ radiation increased the photosensitivity substantially; neutron irradiation resulted in a complete loss of photosensitivity and in an increase of the electrical resistance. These effects are discussed in relation to the effects of these radiations on MoO_3 absorption spectra, reported previously by I. M. Purtseladze et al. (Trudy TGU, Vol. 86: 439(1960)). The high spectral absorption peak at 350 mμ, after γ irradiation, points to oxygen atom vacancy capture of one electron, resulting in photoactive centers. This explains the enhanced photosensitivity due to γ irradiation. The 900-mμ absorption peak due to neutron irradiation is ascribed to the generation of insensitive structural defects (polycrystals and films), thus explaining the loss of photosensitivity by neutron irradiations. It is noted that MoO_3 crystals can be utilized for radiation detection. (JPRS)

46236 STUDIES ON A REACTOR VESSEL STEEL ASTM A-302B. PART IV. NEUTRON IRRADIATION EFFECTS ON THE MECHANICAL PROPERTIES. Shimokawa, Keiji (Yawata Iron and Steel Co., Ltd., Japan); Stern, G. Tetsu To Hagane, 51: No. 11, 90-2(Oct. 1965). (In Japanese).

ASTM A-302B steel and A-302B weld steel from the Yawata Iron and Steel Corp. for use in a reactor pressure vessel were neutron irradiated in order to study the effect on the mechanical properties. The chemical composition of the tested steel was C 0.08 ladle (0.19 check), Si 0.21 (0.21), Mn 1.28 (1.23), P 0.009 (0.010), S 0.006 (0.006), Cu 0.09 (0.072), Cr 0.04 (0.041), Mo 0.55 (0.56), Ni 0.03 (0.027), Co (0.009), and Al (0.039). The plates were compared to those manufactured in the U. S. in the hardness, tensile strength, impact stress and structure for the irradiation at 10^{19} nvt and 10^{20} nvt (1 Mev) at 93 to 149°C. The transition temperature of Yawata steels was lower than the U. S.'s for both irradiations; their properties are as good as any similar steel in the U. S., with the change by the irradiation at the transition temperature (30 ft-lb) being very small. In the tensile properties,

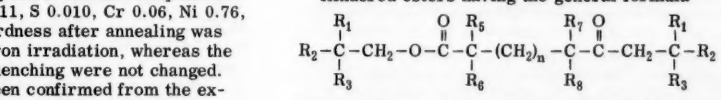
Yawata's are better in the elongation and twist than the U. S.'s. The yield and tensile strengths were increased by neutron irradiation, but these rates are lower in the Yawata's. In neutron irradiation, the Yawata's weld metal was decreased the most in the ductility, but no change was observed in the structure. (NSA of Japan)

46237 STUDIES ON A REACTOR VESSEL STEEL ASTM A-302B. PART V. TRANSMISSION ELECTRON MICROSCOPY OF THE NEUTRON-IRRADIATED A-302B STEEL. Nagasaki, Ryukichi (Japan Atomic Energy Research Inst.); Nagashima, Shinichi. Tetsu To Hagane, 51: No. 11, 93-5(Oct. 1965). (In Japanese).

Irradiation tests of ASTM A302B steel were made to study the change in the mechanical properties caused by neutron irradiation and the corresponding lattice defects and to note the neutron irradiation effect on the precipitation of carbide. The tested specimen with Ni added to improve its low-temperature properties had the composition: C 0.14, Si 0.22, Mn 1.40, P 0.011, S 0.010, Cr 0.06, Ni 0.76, Mo 0.55, and Al 0.014. The hardness after annealing was increased remarkably by neutron irradiation, whereas the mechanical properties after quenching were not changed. These findings have already been confirmed from the experiments on Cu and Al by the fact that lattice holes or lattice defects caused by the neutron irradiation or quenching are cohered to form the dislocated pool or helical dislocation; this is also the case for Fe. By the irradiation at 1×10^{19} nvt, its dislocation, as observed under the microscope, were smooth straight lines forming a stable net, showing that they existed even before neutron irradiation. Since the change in the mechanical properties due to irradiation was large, it is evident that there were formed defects upon irradiation which prevented the dislocations from shifting. Therefore, the irradiation lattice defects, contributing to the effect of neutron irradiation, are presumed to be too small to be detected by an electron microscope. Since the density of defects is high and the interaction between the defects and carbon atoms is strong, the positions where dislocation spikes have been formed tend to be the nucleus of carbide precipitation. When the voids caused by irradiation and C atoms are coalesced, they are checked in their movement, and therefore the precipitation in the systematic sense may be made slow. This explains why the precipitation is retarded and its size, shape and distribution are changed in neutron-irradiated steels. (NSA of Japan)

46238 USE OF HINDERED ESTERS OF CARBOXYLIC ACIDS AS RADIATION RESISTANT LUBRICANTS. McCabe, Leo J. (to Continental Oil Co.). U. S. Patent 3,271,315. Sept. 6, 1966. Filed Nov. 1, 1963.

Hindered esters having the general formula



in which R_1 and R_3 are alkyl groups containing not more than 3 C atoms in each, R_2 is an acyclic alkyl group containing from 2 to 8 C atoms and may contain a single branch of not more than 2 C atoms, R_5, R_6, R_7, and R_8 are acyclic alkyl groups containing from 2 to 4 C atoms each, and n is an integer varying from 2 to 6 are proposed as radiation-resistant, high-temperature-resistant lubricants. Various esters with corresponding resistance to radiation and hydrolytic environmental conditions are tabulated. (B.L.M.)

PHYSICS

General

46239 (ANL–7145) DEFORMATION ANALYSIS OF A CIRCULAR COUPLED-PLATE STRUCTURE. Halle, H. (Argonne National Lab., Ill.). Mar. 1966. Contract W-31-109-eng-38. 27p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A structure consisting of two circular, parallel plates, interconnected by a grid work of equally spaced members, subjected to normal axisymmetric loading, is analyzed for its overall deformation behavior. Approximate equations presented for the evaluation of deflections and stresses are shown to be sufficiently accurate for engineering estimates and permit examination of the relative influence of the various plate and grid parameters on the deformation behavior of the structure. Model tests provided verification of the analysis. The analytical method is essentially based on the superposing of two deformation components which account for the bending of the plates, when the connecting grid members are considered to be ideally rigid, and the additional effects resulting from the actual deformation of these members. These two components represent bending of the plates about a common intermediate neutral axis, and about their individual internal neutral axes, respectively. The analytical and experimental study was also extended to coupled-beam structures. (auth)

46240 (ORNL–3973(Vol.1)) NEUTRON PHYSICS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING MAY 31, 1966. (Oak Ridge National Lab., Tenn.). Sept. 1966. Contract W-7405-eng-26. 73p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Separate abstracts were prepared for the six sections of the report. (S.F.L.)

For abstracts of individual sections see: 45958, 46048, 46592, and 46928–46930.

46241 (SC-R-66-896) TABLES OF Ψ-FUNCTIONS. Harrison, Charles W. Jr.; King, Ronold W. P. (Sandia Corp., Albuquerque, N. Mex.). Apr. 1966. Contract AT(29-1)-789. 24p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Certain integrals useful in the approximate solution of the integral equation for the current in a cylindrical antenna are evaluated and represented graphically and in tabular form. (auth)

46242 (TID–23239) PROGRESS REPORT [ON PARTICLE PHYSICS], APRIL 1965–APRIL 1966. (Princeton Univ., N. J.). Contract AT(30-1)-937. 47p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Experimental work on the Princeton f-m cyclotron is reported. Improvements in apparatus and optimization of operating conditions are giving higher useable intensity and better energy resolution. Experiments on nuclear reactions are concentrating on the upper reaches of the $1f_{\frac{7}{2}}$ shell. Work is beginning on the next higher shell with pickup reactions and inelastic proton scattering. (S.F.L.)

46243 (AERE-Trans–1056) CALCULATION OF MECHANICAL STRESS IN COILS OF REVOLUTION USED FOR THE PRODUCTION OF INTENSE MAGNETIC FIELDS. Leon, B. Translated by W. G. Stripp (Atomic Energy Research Establishment, Harwell, Eng.), from Rev. Gen. Elec., 73: 632-6(1964). 12p. Dep. mn. BIS $0.50. HMSO 2s. 6d.

The design of windings intended for the production of intense magnetic fields is governed by the stresses to which the materials will be subjected. A new method of calculating these stresses, which leads to results similar to those obtained by other workers, is described. To make the expressions more easily calculable with the aid of an electronic computer, the radial force is represented by a polynomial. The method was applied to the calculation of the stresses in a winding for the Centre d'Etudes Nucléaires a Saclay. (auth)

46244 ELECTRIC CONDUCTIVITY OF ORGANIC SEMICONDUCTORS. Cobas, Amador (Centro Nuclear de Puerto Rico, Rio Piedras). pp 99-110 of I Conferencia de Espectroscopia Nuclear y Fisica del Estado Solido, Lima, Organizacion de Universidade Catolicas de America Latina, 1964. (In Spanish).

A bibliographic review is made of the properties of organic semiconductors, with emphasis on the electric conductivity. The measurement technique used in the study of organic semiconductors is outlined. The technical uses of these semiconductors are summarized. (J.S.R.)

46245 SOME PHENOMENA OF GAMMA-RADIATION-INDUCED CONDUCTION IN HYDROCARBON LIQUIDS. Yahagi, K.; Kao, K. C.; Calderwood, J. H. (Royal Coll. of Advanced Technology, Salford, Eng.). J. Appl. Phys., 37: 4289-91(Oct. 1966).

A study of induced electric conductivity of n-hexane was continued in an attempt to present a model to explain the current transient phenomenon and the effects of hexene-2 as additive in n-hexane. In the nonirradiated liquid the conduction current decays with time after the application of an electric field, but in the liquid under irradiation this tendency is reversed. When the applied voltage is suddenly replaced with a short circuit, the current in nonirradiated liquid momentarily assumes a negative value and then gradually increases to zero; in the liquid under irradiation, the induced current after short circuit remains positive and gradually decays to zero. The conduction current in nonirradiated n-hexane is significantly increased by the addition of a small percentage of hexene-2. Under irradiation the steady-state induced current decreases with increase of hexene-2 concentration, reaching a minimum with an addition of about 0.4% and rising as the percentage is increased. Explanations for these phenomena are suggested. (A.G.W.)

46246 GROUND-STATE DENSITY MATRICES OF QUANTUM FLUIDS. Garrod, Claude (Univ. of California, Davis). Phys. Fluids, 9: 1764-5(Sept. 1966).

It is shown that important simplifications can be made in a variational calculation of the ground-state two-particle density matrix of an N-particle system if the system is translation-invariant. (auth)

46247 THEORY OF CYCLOTRON WAVES PARAMETRICAL AMPLIFICATION IN BEAM DEVICES WITH CROSSED FIELDS. Gurzo, V. V.; Stalmakhov, V. S.; Trubetskov, D. I. Radiotekhn. Elektron., 10: 2251-4 (Dec. 1965). (In Russian).

An analysis was made for evaluating, within the limit of linear theory, the process of parametric amplification of cyclotron waves in narrow-beam devices with crossed fields. (R.V.J.)

46248 SYNCHROTRON RADIATION OF AN ELECTRON WITH VACUUM MAGNETIC MOMENT. Ternov, I. M.; Bagrov, V. G.; Zhukovskii, V. Ch. Vestn. Moskov. Univ., Ser. III, Fiz. Astron., No. 1, 30-6(Jan.-Feb. 1966). (In Russian).

Dirac equations were obtained for electrons with vacuum magnetic moment moving in a constant homogeneous magnetic field. The precise solutions are applied in the problem of synchrotron radiation. (tr-auth)

46249 SYMPOSIA ON THEORETICAL PHYSICS. VOLUME 2. Lectures Presented at the 1964 Second Anniversary Symposium of the Institute of Mathematical Sciences, Madras, India. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966. 247p. $12.50. (CONF-640107).

Separate abstracts were prepared for 17 of the 19 in-

cluded papers. The remaining 2 were not in the scope of NSA and hence omitted. (M.O.W.)

For abstracts of individual papers see: 46317, 46377–46379, 46406–46411, 56505, 46506, 46526, 46527, 46767, 46768, and 46890.

Accelerators

46250 (BNL–10565) RADIOFREQUENCY BEAM SEPARATOR AT BROOKHAVEN. Hahn, H. (Brookhaven National Lab., Upton, N. Y.). [1966]. Contract AT(30-2)-Gen-16. 28p. (CONF-660918–2). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From International Conference on Instrumentation for High Energy Physics, Stanford, Calif.

The Brookhaven r-f beam separator which was installed together with a beam transport system at the Alternating-Gradient Synchrotron is described. Topics included are the parameters of the r-f separator, deflector, microwave system, counters, and performance. (B.G.D.)

46251 (BNL–10587) MAGNETIC MATERIALS IN TWO-DIMENSIONAL FIELDS. Beth, Richard A. (Brookhaven National Lab., Upton, N. Y.). Aug. 19, 1966. Contract AT(30-2)-Gen-16. 8p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A report is presented in order to formulate and illustrate a complex magnetic interface theorem for treating two-dimensional magnetic fields at a cylindrical interface between media of differing permeability. The interface theorem, like the analogous current sheet theorem of AADD-102, is useful for treating two-dimensional field problems by exploiting the theory of functions of a complex variable. (B.G.D.)

46252 (CERN–66-25) OPTIQUE DES FAISCEAUX PRIMAIRES. TRAITEMENT ANALYTIQUE D'UNE DENSITE NON UNIFORME DANS L'ESPACE DES PHASES. (Optics of Primary Beams. Analytic Treatment of a Non-Uniform Density in Phase Space). Bovet, C. (European Organization for Nuclear Research, Geneva (Switzerland)). 1966. 31p. Dep. mn.

When an external target (or even several external targets in series) is used, then primary beam optics are relevant to the transfer of the beam from the extraction point to the targets. A primary beam is characterized by a non-uniform density in the transverse phase space (y, dy/ds, z, dz/ds). An analytical formula to this density is given, and also definitions of emittance and beam envelope, which may be calculated at every point of the transfer system. The analysis allows us to consider linear elements as well as the effects of diffusing media (energy loss and multiple scattering) and also the dispersion effects of the bendings, due to $\Delta p/p$. (One obtains, therefore, the increase of the emittance when a beam traverses a volume of material or undergoes deflections.) A FORTRAN programme is available. (auth)

46253 (CERN–66-26) THE TIME-MULTIPLEXED PULSE TRANSMISSION SYSTEM: POLYCANAL. Pflumm, H. (European Organization for Nuclear Research, Geneva (Switzerland)). Aug. 9, 1966. 37p. Dep. mn.

A multiplex transmission system operating on the basis of time division and transmitting timing pulses is described. The transmitted pulses conserve their qualities as regards shape and time stability in reference to the CERN proton synchrotron cycle. A first system with 60 channels has recently been put into operation for the remote control of the East Area ejection magnets and their power supply. The transmission of analog information is envisaged. (auth)

46254 (COO–1545-13) SOME MEASURED PROPERTIES OF THE EXTERNAL PROTON BEAM AT THE ZGS. Kim, Y. S.; Marmer, G. J.; Reibel, K. (Ohio State Univ., Columbus); Phillips, P. R.; Swallow, E. C. (Washington Univ., St. Louis, Mo.); Ratner, L. G.; Rush, C. S. (Argonne National Lab., Ill.); Romanowski, T. A. (Argonne National Lab., Ill. Ohio State Univ., Columbus). Aug. 12, 1966. Contract AT(11-1)-1545. 28p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Properties of the extracted beam at the ZGS which were measured are: emittance; beam spot size at both foci when the optimum transport efficiency from the yoke hole to the second focus was obtained; proton extraction efficiency for both long and short spills, for different internal target configurations and for different momenta of the circulating beam; and the time structure of the beam for different operating conditions of the ZGS. (B.G.D.)

46255 (IKF–18) DEUTERIUM- UND TRITIUM-GASTARGETS. (Deuterium and Tritium Gas Targets). Meinel, K.; Debertin, K. (Institut fuer Kernphysik, Universitaet Frankfurt (West Germany)). Aug. 1966. 24p. Dep. mn.

The construction, filling system, and safety devices of the tritium gas target are described. The operational procedure and operational experiences gained are briefly indicated. (J.S.R.)

46256 (LA-DC–7642) LOS ALAMOS MESON FACTORY: PRESENT STATUS AND FUTURE PLANS. Hagerman, Donald C. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [nd]. Contract W-7405-eng-36. 6p. (CONF-660510–4). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Isochronous Cyclotrons, Gatlinburg, Tenn.

The present status and future plans of the work at Los Alamos Scientific Laboratory on a meson factory project are described. At the time of writing, some 40 scientists and engineers are engaged in research and development activities for this project. The primary emphasis at present is on the linear accelerator which will generate the proton beam for meson production; in the future, this emphasis will shift to research activities connected with the use of the accelerator as a tool of experimental physics. More detailed descriptions of this work can be found in the quarterly progress reports (LA-3419-MS and following reports). A general description of the accelerator is presented and detailed descriptions of particular research and development activities are included. (auth)

46257 (LNF–66/38) THE INFRA RED RADIATIVE CORRECTIONS FOR COLLIDING BEAM (ELECTRONS AND POSITRONS) EXPERIMENTS. Note No. 331. Etim-Etim; Pancheri, G.; Touschek, B. (Laboratorio Nazionali di Frascati, Comitato Nazionale per l'Energia Nucleare (Italy)). Aug. 22, 1966. 28p. Dep. mn.

The experimental tools for applying the infrared radiative corrections for colliding beam experiments are presented. The reactions of the type $e^+ + e^- \rightleftharpoons A + \bar{A}$, where $\bar{A}$ is an antiparticle of A, are considered. (B.G.D.)

46258 (NP–16312) NEKOTORYE OSOBENNOSTI FOKUSIROVKI IONNYKH PUCHKOV LINEINYMI STATSIONARNYMI POLYAMI. (Some Peculiarities of Ion Beam Focusing by Linear Stationary Fields). Sivkov, Yu. P. (Institut Atomnoi Energii, Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow). 1966. 15p. Dep. mn.

The focusing of ion beams by time-independent fields is viewed as a transformation of four-dimensional phase volumes containing the points representing particles. A system of invariants is established representing the consequences of the integral invariants of the dynamic equation connecting the coefficients of four-dimensional ellipsoids in phase space during a linear simplectic transformation of coordinates. Various peculiarities are noted of such transformations and carried out in particular with the separation of the group of ellipses into classes within which simplectic transformations of one ellipsoid into another are possible. (TSS)

46259 (UCRL–16828) THE OMNITRON: A MULTIPURPOSE ACCELERATOR. (Lawrence Radiation Lab., Univ. of California, Berkeley). July 1966. Contract W-7405-eng-48. 258p. Dep. mn. CFSTI $6.00 cy, $1.25 mn.

A proposal is presented for construction of a multipur-

pose accelerator facility at the Lawrence Radiation Laboratory. The new facility, the Omnitron, will make important extensions in research in the fields of nuclear chemistry, biology and medicine, and medium-energy physics. The Omnitron is made up of two concentric alternating-gradient rings, a rapid-cycling synchrotron and a storage ring, both approximately 120 ft in diameter. The proposal contains research programs, heavy-ion accelerators, general description of the Omnitron, accelerator parameters, magnet system, vacuum system, accelerating system, injection system, extraction system, radiation problems, site and utilities, buildings, experimental areas and technical components, support facilities, construction scheduling, construction-cost estimate, and operation estimates. (B.G.D.)

46260 (AEC-tr-6636) ELECTRIC INSTRUMENTATION IN HIGH-ENERGY PHYSICS. COLLECTION OF PAPERS, NO. 1. Komar, E. G. (ed.). Translation of Elektrotiz. App., Sb., Statei, No. 1, 3-202(1963). 169p. (IPST-Cat.-1509). CFSTI $5.00 cy, $1.00 mn.

A report is presented on the design problems, new developments, and research on electrophysical devices. The results of theoretical calculations on electron-optical and ion-optical systems of strong focusing direct-action accelerators, modified synchrotron structures, power supply circuits and their regulation for application to accelerators, and low-voltage resonance electron discharges (multipacting) are summarized. Experimental works on the production of ion and electron sources, the magnetic structures of synchrocyclotrons, and the production of vacuum volumes for accelerators are discussed. Experimental results are also presented on the resonance method of investigating diaphragmed waveguides, the alignment of a 120 cm cyclotron, the use of laminations for a strong-focusing accelerator electromagnet, and other original studies of a practical nature. (auth)

46261 ELECTROLYTIC TROUGH MEASUREMENTS CONCERNING THE ELECTROSTATIC FIELD OF PRESSURIZED VAN DE GRAAFF GENERATORS. Kiss, Arpad; Koltay, Ede; Szalay, Sandor (KLTE, Kiserleti Fizikai Intezete, Debrecen, Hungary). At. Kozlem., 8: 101-14 (June 1966). (In Hungarian).

In order to obtain nearly ideal electrode configuration for pressurized Van de Graaff generators model measurements were carried out using the electrolytic trough method. As a result of these investigations a new electrode system is proposed consisting of a high voltage terminal shaped as third order paraboloid of rotation matching to a spherical calotte and equipotential rings of oval section. In this system the electrical stress is nearly uniform on the electrode surfaces. The field strength remains everywhere under the value given by extrapolating of its linear increase along the column to the position of the first equipotential ring. (auth)

46262 DEVELOPMENT OF AN OBJECTIVE MADE WITH QUADRUPOLE LENSES AND CORRECTED FOR APERTURE ABERRATIONS. Dhuicq, Daniel; Septier, Albert (Faculte des Sciences, Orsay, France). Compt. Rend., Ser. B, 263: 364-7(Aug. 1, 1966). (In French).

The three coefficients of aperture aberration were calculated for a particular case of an objective with four quadrupole lenses; it is shown that it is possible to cancel these three coefficients at one time by using three octupoles judiciously arranged in the system. (G.O.Y.)

46263 PUMPING PROBLEMS IN AN ISOCHRONOUS CYCLOTRON. Jean, R.; Dupuis, A. (Centre d'Etude de la Compagnie Generale de Telegraphie sans Fil, Orsay, France). Vide, 21: 273-8(July-Aug. 1966). (In French).

Isochronous or classical cyclotrons are pumped up to now with conventional equipments. The high pump speeds required to compensate the gas flow of the internal ion source are limited by the limited conductance of the vacuum chambers and the operating pressures are of the order of 10^{-3} absolute pressure. There are only fabrication problems. This situation is about to change with isochronous cyclotrons built for acceleration of negative ions or polarized particles in which pressure requirements are more severe. External ion sources will probably help but it will be necessary to improve the pumping system and cryopumps seem to be well suited for such a problem. (auth)

46264 THE VACUUM IN A TRITON ACCELERATOR. Oberlin, J. C. (Centre de Recherche Nucleaire, Strasbourg). Vide, 21: 279-82(July-Aug. 1966). (In French).

Tritons acceleration presents no difficulties, but the use of tritium is delicate in consequence of contaminations on the mechanical parts and the employees. In order to reduce dangerous interventions on the machine and annex, circuits it is useful to possess special materials (e.g., tritium container, adjustable valve, vacuum circuit) and also to have a way to protect efficaciously the employees (mask, gloves, ventilation). (auth)

46265 USE OF TURBOPUMP IN AN ELECTROSTATIC ACCELERATOR. Gerbier, R.; Muel, J. (CEN, Grenoble, France). Vide, 21: 283-6(July-Aug. 1966). (In French).

A 140 l/s turbomolecular pump is used for pumping a 3-Mev Van de Graaff electron accelerator. Qualities of this pumping system are low running cost, no pollution, simplicity of security devices and automatic functioning, easy recovery of good vacuum in extension pipes after air admittance, and possibility to control the pressure inside the accelerating tube (about 3.10^{-6} torr) with hydrogen admittance in the primary vacuum. Pumping of ion accelerators with such vacuum device is possible, but the primary vacuum has to be specially good. (auth)

46266 THE ACCELERATOR TUBE IN VAN DE GRAAFF-TYPE ELECTROSTATIC ACCELERATORS. Delaunay, B. (CEN de Saclay, Gif-sur-Yvette, France). Vide, 21: 291-8(July-Aug. 1966). (In French).

A short survey is given of results obtained in vacuum discharges research. Some experimental data on the Saclay Tandem tube conditioning are presented. In conclusion an attempt is made to analyze the phenomena observed. (auth)

46267 RECIRCULATION APPARATUS FOR ^{3}He IN A CYCLOTRON. Revel, G.; Albert, P. (Centre National de la Recherche Scientifique Vitry-sur-Seine, France). Vide, 21: 299-301(July-Aug. 1966). (In French).

The nuclear reactions produced by ^{3}He allow the analysis of several elements in metals (particularly oxygen). A very simple apparatus was constructed to allow the recirculation of ^{3}He in a classic isochronous cyclotron. With 500 cm^3 of pure ^{3}He it is possible to have a good operation of a cyclotron during several weeks. There were no noticeable loss in helium for a twenty day run. The helium beam which was obtained on an outside target had an intensity of 30 μamp. (auth)

46268 NONSTATIONARY SELF-CONSISTENT MODEL OF AN AZIMUTHALLY UNIFORM RING OF CHARGED PARTICLES IN AN EXTERNAL ELECTROMAGNETIC FIELD. Yarkovoi, O. I. Zh. Tekh. Fiz., 36: 988-96 (June 1966). (In Russian).

The basic ideas of the nonstationary self-consistent model of an azimuthally uniform ring of charged particles in an arbitrary external field are presented. The calculation technique was developed because of its utility for the design and analysis of storage rings. The model is based on the "x-linear approximation," which consists in the assumption that the difference between the forces on an axial and an off-axis particle is directly proportional to the distance of the off-axis particle from the axis. A nontrivial positive definite integral of motion is constructed in the x-linear approximation from solutions of the differential equations conjugate to the equations of motion, and with the aid of that integral the equations of motion are reduced to a set of nonlinear differential equations that, at least under some conditions, are tractable. The x-linear approximation imposes no limitations on the time dependence of the external field and does not involve linearization of the kinetic equation. The resulting theory is a kinetic theory, rather than a several-component hydrody-

namic theory, in the sense that at each point there is a continuous distribution of momenta. The stress tensor vanishes only on the boundary of the particle beam, and the theory accordingly permits calculation of the motion of the boundary. The final equations can be simplified in certain special cases that are discussed very briefly; in the case of an adiabatic process the equations reduce to a set of algebraic equations. The calculation technique can be generalized to the case of an azimuthally nonuniform charged particle ring. (ATD)

46269 ON THE POSSIBILITY OF LIMITED MOTION OF A CHARGED PARTICLE IN THE FIELD OF A TRAVELING ELECTROMAGNETIC WAVE. Verbitskii, I. L. (Inst. of Radiophysics and Electronics, Kharkov). Zh. Tekh. Fiz., 36: 1065-74(June 1966). (In Russian).

The nonrelativistic motion of a charged particle in the field of a traveling electromagnetic wave of finite amplitude is discussed in very general terms. It is shown that with appropriate choice of the amplitude and form of the wave there is possible a very wide variety of particle motions, including motions in which the average velocity of the particle is zero, i.e., in which the particle motion is periodic with a finite amplitude. All the motions except those in which the particle velocity is equal to the phase velocity of the wave are unstable with respect to small changes in the initial conditions. It is shown, however, that in the presence of friction forces on the particle and spatial variations of the phase velocity of the wave, other motions, including periodic motions with finite amplitude, may be asymptotically stable, and stability conditions are derived. It is suggested that the stability conditions presented may be of use in connection with liquidation of beam instabilities and design of charged particle storage devices. (ATD)

46270 RADIATION WINDOW FOR AN ELECTRON ACCELERATOR. Kitagawa, Kazue (to Sumitomo Electric Industries, Ltd.). Japanese Patent 1965-7440. Mar. 6, 1965. Filed Apr. 16, 1964.

Two sheets of Hycar or rubber gasket are usually used to hold airtight an aluminum foil onto the radiation window of an electron accelerator, the foil being pushed from both sides. However, the material of this gasket is deteriorated in short periods of time under the influence of radiation, resulting in the breakage of the high vacuum. In the radiation window proposed, metal gaskets are used in place of the rubber or gaskets, eliminating the problem. (NSA of Japan)

46271 DEVICE FOR MOVING A TARGET MATERIAL USED FOR NEUTRON PRODUCTION. Iwashita, Fumio (to Tokyo Shibaura Electric Co., Ltd.). Japanese Patent 1965-20832. Sept. 15, 1965. Filed Sept. 11, 1964.

An improved target-moving device is proposed, which moves the target holder, as required, against the central axis of the accelerating tubes. The adjustment of the target can be done in relatively short periods of time, and also the use efficiency of target materials can be increased considerably. A flexible joint is provided between the accelerating tube and the target holder, and the target is moved helically by a drive. (NSA of Japan)

46272 DEVICE FOR REGULATING THE POSTURE (OR POSITION) OF A NEUTRON-PRODUCING TARGET. Iwashita, Fumio (to Tokyo Shibaura Electric Co., Ltd.). Japanese Patent 1965-20831. Sept. 15, 1965. Filed July 31, 1964.

An improved device installed at the end of an accelerating tube is proposed for regulating the position of a nuclear-reaction target to produce neutrons. With this device, the target material in its holder can be moved horizontally or vertically to the axis of an ion beam by means of the indicator installed outside the accelerating tube. The device consists of a first and second support. The first support moves perpendicular to the axis of the accelerating tube, and the second support, attached to this first support, moves perpendicular to the movement of the first support. The target holder is attached to this second support. (NSA of Japan)

Astrophysics and Cosmology

Refer also to abstracts 46308, 46375, and 46925.

46273 (AD-640661) TRANSIENT FLARE-ASSOCIATED PHENOMENA IN THE SOLAR ATMOSPHERE. Anderson, Gerald F. (Colorado Univ., Boulder). Sept. 1966. Contract Nonr 1147(13). 238p. Dep. mn. CFSTI $6.00 cy, $1.25 mn.

Thesis.

Disturbances propagating from flares, as observed by high time resolutions Hα Lockheed filtergrams, are analyzed. A theoretical model is developed, assuming a magnetohydromagnetic pulse which is generated by a source located in the flare region, propagates from the source and is refracted in the solar corona. Ray tracing calculations, when fitted to the observations, yield reasonable source heights and magnetic fields. (auth)

46274 COSMOLOGICAL RED-SHIFT PROBLEM AND RADIO GALAXIES. Gomide, F. M. (Instituto Tecnologico de Aeronautica and Comissao Nacional de Atividades Espaciais, Sao Jose dos Campos, Brazil). An. Acad. Brasil. Cienc., 37: 425-32(1965).

The choice of cosmological models resulting from the solutions of the Einstein's relativistic field equations, depends specially on the observational data referring to the spectra and luminosity of galaxies. These data present a relation between the photographic magnitude and the red shift of the spectrum, which, according to the statistics of Humason, Mayall, and Sandage, favors the evolutionary world models. The problem is approached from another angle, to wit: statistical analysis of the relation between the red shift and the radio magnitude of 44 radio sources optically identified with peculiar galaxies. This analysis led to a different result: the relation considered approximates to that predicted by the Einstein-de Sitter static world model. Also, 66 radio sources, weak and medium, identified with normal galaxies exhibit equivalent result. Angular coefficients of 2.78 and 2.88 were found, not far from 2.5, predicted for the static model, whereas the angular coefficient for evolutionary models is equal to 5. This result is aided by the relation obtained from the statistical calculation for the red shifts and distances of 6 nearby groups and clusters of galaxies. The analysis is not inconsistent with that done by Hawkins for the photographic magnitude-red shift relation of field galaxies up to magnitude 14. (auth)

46275 EMPIRICAL MODELS OF STELLAR ATMOSPHERES. II. STATISTICAL STUDY, MODEL OF A SUNSPOT. Van't Veer, Frans (Institut d'Astrophysique, Paris). Ann. Astrophys., 29: 119-30(Mar.-Apr. 1966). (In French).

An earlier report, in which a method was developed for obtaining empirical models for certain stellar atmospheres, is continued here. A study of the handling of spectroscopic criteria and parameters, leading to a determination of the best model, is presented. The problem is mainly how to judge the quality of the final model, given the probable errors of the observations and the simplifications introduced by using only 4 parameters. By a statistical study of the problem it was possible to develop new criteria which give a rating of the quality of each model. This rating scale makes it possible not only to find the best model, but also to estimate its value and thus the validity of the method. The problem of the model of a sunspot already considered in the first report is re-examined and it was found that by using the empirical method it is possible to specify a valid sunspot model with satisfactory accuracy. The features of this model are compared to those of earlier models. (BBB)

46276 TIDES IN CLOSED BINARY STARS. Zahn, J.-P. (Institut d'Astrophysique, Paris). Ann. Astrophys., 29: 313-30(July-Aug. 1966). (In French).

The major properties of tides in a close binary system and their effects on the dynamic and nuclear evolution of the system are examined. The equations of the problem and the adiabatic tide, in phase with the perturbing poten-

tial and the dissipative tide, which is in quadrature, are described. The most important causes of dephasing are viscous friction in turbulent convective zones and radiative damping in the zones which would normally be in radiative equilibrium; these give rise to the convective tide and to the radiative tide respectively. As a result of these two dissipative tides, there is a torque on each component and this torque has one effect, a variation of the eccentricities of the orbits. The hydrostatic approximation is defined and the poloidal and toroidal velocity fields of the adiabatic tide are described in this approximation. A phenomenon analogous to resonance is found which involves in general only a discrete number of shells of the star. (M.O.W.)

46277 A THEORY OF THE ORIGIN AND EVOLUTION OF CONTACT BINARIES. Huang, Su-Shu (Northwestern Univ., Evanston, Ill.). Ann. Astrophys., 29: 331-8 (July-Aug. 1966).

It is proposed that the orbital angular momentum of binaries may be dissipated through mass ejection along magnetic lines of force. It brings the separation of two component stars closer and closer, such that in some cases contact binaries, like W UMa systems, may be formed in this way. If the dissipation of angular momentum continues after the two components come into direct contact, the course open for the binary is to transfer mass from the less massive to the more massive component. Three observational results — (1) the mass ratios of the W UMa systems, (2) the negative correlation between the axial rotation and the frequency occurrence of spectroscopic binaries in different clusters and associations, and (3) the stars of hydrogen-poor and helium-rich atmospheres — are discussed in the light of this suggestion. (auth)

46278 EVOLUTION OF SYNCHROTRON RADIATION SPECTRA. De La Beaujardiere, Odile (Observatoire de Meudon, France). Ann. Astrophys., 29: 345-54(July-Aug. 1966). (In French).

A theoretical study was made of the time evolution of the synchrotron radiation spectrum of radiosources. A complete numerical computation of the intensity was carried out. The following simple case is considered: only synchrotron radiation losses are considered; the magnetic field is isotropic: its intensity is constant, with random space orientation; electron density is constant, and the electrons are injected isotropically into the source with an initial spectrum of the form $N(E,O) = KE^{-\gamma}$. Two modes of injection are considered: (1) a single initial injection at time t = 0; and (2) continuous injection throughout the life of the radiosource. (M.O.W.)

46279 SOLAR ABUNDANCES OF SOME 4f-TYPE RARE EARTHS. Righini, Alberto (Padua Observatory); Rigutti, Mario. Ann. Astrophys., 29: 379-87(July-Aug. 1966).

The solar abundances of seven rare earths (Ce, Pr, Nd, Sm, Eu, Gd, Dy) are deduced for the center of the solar disk with the weighting function method. Mutschlecner's semi-empirical solar model was employed. gf-values and partition functions are taken from Corliss and Bozman's recent laboratory results. Identifications come from C. H. Moore-Sitterly and equivalent-widths from the Utrecht Photometric Catalogue. An estimate of the errors of the results and a comparison with earlier meteoric abundances is made. (auth)

46280 EXPERIMENTAL POSSIBILITIES OF OBSERVING COSMIC NEUTRINOS. Guseinov, O. Kh. (Shemakha Astrophysical Observatory, Academy of Sciences, Azerbaidzhan SSR). Astron. Zh., 43: 772-8(1966). (In Russian).

The possibilities of observing the high-energy neutrinos emitted during the collapse of a star against the background of solar and cosmic secondary neutrinos are discussed. The concept of star collapse includes both the case in which a star is transformed into a neutron star having a radius of the order of 10 km as well as the case of relativistic collapse with an asymptotic approximation of the Schwarzschild radius. It is shown that the rapid contraction of a star is accompanied by the emission of high-energy (~50 Mev) neutrinos and antineutrinos. Star collapse and its concomitant phenomena are believed to occur when the mass of a star exceeds 1.2 M. Thus, there must be between 5 and 10 instances of star collapse a year in the Galaxy. The expected flux ν and $\bar{\nu}$ at the earth due to star collapse is estimated at $\sim 10^{13}-10^{15}$ ν, $\bar{\nu}$/cm^2 sec. (ATD)

46281 PHOTOELECTRIC MEASUREMENT OF THE RADIATION FROM THE RADIO SOURCE 3C-273 BETWEEN 0.35 AND 1.1 μ. Mianes, Pierre (Observatoire, Bordeaux. Saint-Michel-l'Observatoire, Basses-Alpes, France). Compt. Rend., Ser. B, 263: 410-13(Aug. 1, 1966). (In French).

The measurements of six colors from the quasar 3C-273 show a great variation in the domain of wavelengths above 5500 Å. These variations are extremely complex and a systematic study of them should be undertaken. For the wavelengths below 5000 Å the thermal behavior of the radiation shows only slight variations in its color temperature. (tr-auth)

46282 STATISTICAL CONSIDERATIONS ON THE RELATIONS BETWEEN SPACE PHENOMENA AND PHYSICAL-CHEMICAL AND BIOLOGICAL PHENOMENA. Piccardi, G. (Univ., Florence). pp 245-51 of XI Convegno della Salute, Ferrara, Italy, May 23-4(1964). Modena, Stabilimento Poligrafico Artioli, [1965].

The correlation between sunspot activity and other astrophysical phenomena with chemical and biological tests designed to register these phenomena is examined. A review is given of the correlation of results of the D test and F test with the Wolf number for solar activity. Results of the F test showed a procession from 1951 to 1962 in the relative seasonal occurrence of minimal values in accord with changes in sunspot activity. Tables give the correlation coefficients calculated for results of the various tests. Some of the chemical tests reveal a diurnal variation. In biological tests, a correlation could be found between changes in leukopenia and Wolf Number. (BBB)

46283 LUMINESCENCE SPECTRA OF METEORITES. Geake, J. E.; Walker, G. (Univ. of Manchester, Eng.). Geochim. Cosmochim. Acta, 30: 929-37(Sept. 1966).

The luminescence spectra of 20 stony meteorites of several different classes are given. Proton excitation was used, as uv radiation was found to be ineffective. Estimates of radiation conversion efficiency are given, and found to fall into three groups. Changes in the luminescence spectra after proton damage are shown; the spectra and the changes are both shown to be characteristic of the class of meteorite. (auth)

46284 ON A PHASE ANOMALY SHOWED BY CHEMICAL TEST D. Piccardi, Giorgio (Univ., Florence). Geofis. Meteorol. (Genoa), 15: 73-4(1966).

During the decreasing phase of the last sunspot cycle the D chemical test showed a phase anomaly. The annual min value of test D which for 10 yr had appeared in spring, appeared in summer in 1962, and from 1963 in autumn. Other natural phenomena showed a phase anomaly in the same period. Changes in human leukocyte levels in 1964 as contrasted to changes in 1954 are also said to reflect this anomaly. In the F test (not explained) the min monthly index from 1951 to 1965 showed a precession which, after 15 years, returned it to the same position it had in 1951. The P test was not influenced. The min monthly index appeared regularly every year in summer. This is explained as reflecting a typical seasonal event, connected with the height of the sun over the horizon. The phenomenon observed is attributed to a change in the general field of interplanetary space. (BBB)

46285 CAUSALITY AND ASTRO-GEOPHYSICAL PHENOMENA. Piccardi, Giorgio (Univ., Florence). Geofis. Meteorol. (Genoa), 15: 75-7(1966).

The nature of chemical, physical, and biological fluctuating phenomena is examined. Their behavior, it is suggested, depends not only on traditional experimental conditions but also on conditions in space. The current concept of causality is valid only if the reproducibility of the tests is perfect and it consequently requires the possibility of a return to the initial conditions. However, this is not so, at

least for some fluctuating phenomena. In many cases it is better to establish a direct relation between one event and the other rather than establishing a statistical relation between two groups of events. Examples are cited of the use of a chemical test to demonstrate fluctuations of results in correspondence with sunspot activity. The chemical test showed changes in readings correlated with eruptions noted on March 16, 1966. (BBB)

46286 MEASUREMENTS OF THE LUNAR SURFACE γ-RADIATION ON THE COSMIC STATION "LUNA-10." Vinogradov, A. P.; Surkov, Yu. A.; Chernov, G. M.; Kirnozov, F. F.; Nazarkina, G. B. (Vernadskii Inst. of Geochemistry and Analytical Chemistry, Moscow). Geokhimiya, No. 8, 891-9(Aug. 1966). (In Russian).

Preliminary results obtained on the intensity and spectral composition of the lunar rock γ radiation, investigated with the aid of a γ spectrometer mounted on the automatic station Luna-10 are given. Evidence shows that about 90% of the total intensity of lunar rock γ radiation is conditioned by nuclear reactions of cosmic rays and not over 10% belong to the radiation arising from the decay of the radioactive elements U, Th, and K contained in lunar rocks. The general level of γ radiation intensity over the lunar surface is 1.5–2.0 times higher than over terrestrial rocks of the granite type. According to their content of radioactive elements, lunar rocks correspond to terrestrial rocks of basic composition (basalts). (auth)

46287 ORIGIN OF THE MICROWAVE RADIO BACKGROUND. Peebles, P. J. E.; Dicke, R. H. (Princeton Univ., N. J.). Nature, 211: 574-5(Aug. 6, 1966).

Recently, Kaufman (Nature, 207: 736(1965)) stated that the newly discovered microwave radio background at 7.3 cm may be emission from ionized intergalactic hydrogen, rather than primordial fireball radiation from the big bang. In this picture, the hydrogen would have a temperature of about 10^6°K, and a present density of 2×10^{-30} g/cm^3. It was assumed in the calculation that, as the universe expanded, the hydrogen temperature remained constant. It is felt that this assumption is not tenable; it requires that the intergalactic hydrogen temperature remains constant while the hydrogen has expanded by a factor of 10^{17} in volume. This would require 2.5×10^{14} ergs/g, much of it over a period of a few years. The power requirement to keep the gas hot while the universe expands is as great as 2.8×10^5 ergs/sec g, 1.4×10^5 times the energy production rate of the sun. No reasonable energy source would be adequate to prevent an adiabatic cooling of the medium during the rapid expansion of the early universe. (W.D.M.)

46288 INTERPRETING THE COSMIC MICROWAVE BACKGROUND. Layzer, David (Harvard Univ., Mass.). Nature, 211: 576-7(Aug. 6, 1966).

Remarks are presented which serve to indicate how certain properties of the present-day cosmic distribution of matter can be related to the kinetic temperature of the pregalactic distribution. A deductive cosmological theory should relate this temperature in turn to the initial conditions of the universe. The main point of the discussion is that the initial thermodynamic temperature of the universe must be assumed to be very low if the internal energy is ever to become negative. The simplest assumption is that the initial state of the universe is one of thermodynamic equilibrium at zero temperature. Such a universe would be matter-dominated throughout and would not possess a "fossil" radiation field. (W.D.M.)

46289 INVERSE COMPTON EFFECT IN QUASARS. Rees, M. J.; Sciama, D. W. (Cambridge Univ., Eng.). Nature, 211: 805-7(Aug. 20, 1966).

The importance of inverse Compton scattering in quasars is discussed. The dimensions of the region where electrons are accelerated are discussed. Models for 3C 273 and similar variable quasars are briefly described, taking the inverse Compton effect into account. (M.O.W.)

46290 RED- OR VIOLET-SHIFT OF QUASARS WITHOUT ANY SOURCE MOTION. Boccaletti, D. (Istituto Nazionale di Fisica Nucleare, Bologna); de Sabbata, V.; Gualdi, C. Nuovo Cimento (10), 45A: 513-19(Sept. 21, 1966).

A possible explanation for the red shift of quasars is examined on the supposition that at the surface of the quasars are present some kind of atoms whose nuclei have some quarks extra or at the place of one or two protons. A simple calculation gives a shift with respect to the energy levels of normal atoms as a result of the charge $\frac{2}{3}$ e of the quark. This spectral shift is calculated for different atoms, and the results are tabulated. The spectra of five quasi-stellar sources are also studied. The possibility of having centimetric radio waves from galactic and intergalactic space, other than 21 cm, is pointed out. (L.B.S.)

46291 IMAGING OF X-RAY STARS WITH THE HOLOGRAM TELESCOPE. Einighammer, H. J. (Univ., Tuebingen, Ger.). Optik, 23: 627-41(1965-6). (In German).

Problems in the formation of images of cosmic radiation (soft x rays) from point sources are examined on the basis of a two-stage procedure proposed by Mertz and Young. The theoretical resolving limit of their process for imaging cosmic x-ray sources by means of the Fresnel transformation was experimentally verified. There are difficulties in the reconstruction of the star images from the shadow hologram when numerous zone patterns are superimposed. The loss of information can be minimized in this case by using zone plates having zones of reduced width. The advantage of the process in comparison with a pinhole camera of equal resolution is the significantly shorter exposure time. In the experiments described a factor of 30 was obtained. This was demonstrated with the use of microdensitometer tracings. The holograms were prepared by photographic superposition. (BBB)

46292 INTERPLANETARY SCINTILLATIONS OF RADIO SOURCES AND THEIR USE IN ASTROPHYSICS. Lotova, N. A.; Finkel'berg, V. M. Usp. Fiz. Nauk, 88: 399-401(Feb. 1966). (In Russian).

The determination of angular dimensions of radio sources depends upon the resolving power of radiotelescopes or, more precisely, upon the directivity diagram. Radiotelescopes with a 1-km base working on meter waves have a directivity diagram from 3′ to 20′, which is inadequate for studying small objects. Since 1950, the method of cosmic radioemission diffraction at the rim of the lunar disk has been used. This method yields a resolving power approximately equal to 20″; it was used for studying the Crab nebula. In 1958, V. L. Ginzburg recommended the scintillation method for studying radio sources. The principle of this method consists in the diffraction of radio waves passing through a layer containing heterogeneities of electron density of characteristic dimensions. When the dimension of heterogeneities is much greater than the wavelength, the scattering action of heterogeneities deforms the phase of the wave. This method is good for studying point-shaped sources when their angular dimensions can be measured by observed scintillations. Scintillations occur when heterogeneities are moving with a definite velocity which causes the fluctuation of a radio wave at the observation point. The scintillation method made it possible to discover and measure angular dimensions of radiosources of 0.1″. It is also applied to studies of the structure of the supercorona of the sun. (ATD)

Atomic Physics

Refer also to abstract 45726.

46293 (AD-628812) APPLICATIONS OF MODERN DEVELOPMENTS IN SCATTERING THEORY TO ATOMIC COLLISION PROBLEMS. Summary Report, March 1, 1965–February 28, 1966. Gerjuoy, Edward (Pittsburgh Univ., Pa.). Contract Nonr-624(16). 29p. CFSTI $2.60 fs, $0.50 mn.

The Faddeev-Lovelace formulation of three-body collision problems is applied to the specific problem of e-H scattering. The Faddeev-Lovelace procedures of e-H scattering are described, but numerical results are not obtained, because the integrals which appear are difficult. These integrals involve the complex momenta of the inter-

acting particles, and are derived making use of the known exact analytic dependence (on the complex momenta of the interacting particles) of the two-body Coulomb scattering amplitude, given previously. (TAB)

46294 (NASA-TN-D-3641) CALCULATIONS OF ENERGY AND ANGULAR DISTRIBUTIONS OF ELECTRONS EJECTED FROM HELIUM BY 200- AND 300-kev PROTONS. Oldham, William J. B. Jr. (National Aeronautics and Space Administration, Houston, Tex. Manned Spacecraft Center). Oct. 1966. 21p. CFSTI $1.00 cy, $0.50 mn.

Doubly differential cross sections for ejection of secondary electrons of various energies at various angles from helium bombarded by 200- and 300-kev protons were calculated and compared with the recent experimental results of Rudd, Sautter, and Bailey. The wave functions employed by Mapleton to calculate ionization cross sections are used in the Born approximation in a first calculation. In a second calculation, the Roothaan four-term wave function is used for the ground state of helium. The two calculated results differ very little. General agreement between theory and experiment for the cross sections is found, but discrepancies are noted in the forward and backward directions. (auth)

46295 (NYO-3708-1) A STUDY OF ALPHA PARTICLE REACTIONS IN ATMOSPHERIC GASES. Quarterly Progress Report No. 1, May 15–August 15, 1966. Fluegge, Robert A. (Cornell Aeronautical Lab., Inc., Buffalo, N. Y.). Aug. 31, 1966. Contract AT(30-1)-3708. 11p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Effort expended during the first quarter of this experimental program was directed toward a re-evaluation of the experimental system described in a proposal for a "Study of Charged Particle Interactions with Gaseous Molecules," in a continuing literature search for related experimental findings and in modifying existing equipment so that it will function properly in the proposed experiments. (auth)

46296 (SC-RR-66-506) TABULATION OF ATOMIC SCATTERING PARAMETERS CALCULATED CLASSICALLY FROM A SCREENED COULOMB POTENTIAL. Bingham, Felton W. (Sandia Corp., Albuquerque, N. Mex.). Aug. 1966. Contract AT(29-1)-789. 42p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

A screened Coulomb potential was used to calculate three quantities of interest in atomic scattering studies: distance of closest approach of the colliding atoms, impact parameter, and differential cross section. The results are tabulated as functions of scattering angle and of a parameter which depends upon the particular atomic species and bombarding energies involved in a given collision. Auxiliary tables are given to facilitate calculation of this parameter. The tables are generally useful for collisions in the energy range from approximately 100 ev to hundreds of kev; restrictions upon their validity are discussed briefly. (auth)

46297 IMPACT PARAMETER METHOD FOR COLLISIONS BETWEEN ATOMIC SYSTEMS. McCarroll, Ronald; Salin, Antoine (Observatoire de Paris). Compt. Rend., Ser. B, 263: 329-32(Aug. 1, 1966). (In French).

A correspondence between the approximations made in a purely quantum study of the problem of collisions of atomic systems and the corresponding approximations in the framework of the impact parameter method is established. The results obtained are applied to the Born approximation for the excitation and for the rearrangements. The system studied is a proton incident on a H atom. (G.O.Y.)

46298 THEORETICAL EVALUATION OF THE IMPORTANCE OF CATHODE SPUTTERING BEYOND THE FOCUSING DIRECTIONS. Joyes, Pierre; Castaing, Raymond (Faculte des Sciences, Orsay, France). Compt. Rend., Ser. B, 263: 384-7(Aug. 1, 1966). (In French).

A possible mechanism for the emission of particles displaced at random in a metal following irradiation with primary ions of a few kiloelectron volts is proposed. The adaptation of this model to a process of particle ionization, which could explain secondary ion emission, is discussed. (tr-auth)

46299 MANIFESTATION OF KIRCHHOFF'S LAW IN GAMMA SPECTROSCOPY. Mazurenko, Yu. T. Dokl. Akad. Nauk SSSR, 168: 320-1(May 11, 1966). (In Russian).

The exact coincidence of absorption and emission lines in the optical region of the spectrum is usually considered as an experimental confirmation of Kirchhoff's law. In γ emitters the absorption and fluorescence are shifted with respect to each other because of photon recoil. The spectral lines should be characterized by a definite frequency distribution of intensity. It follows from Kirchhoff's law $I_\nu/\alpha_\nu = CK_\nu = [C\ 2h\nu^3/C^2] \exp(-h\nu/kt)$. Here I_ν is the fluorescence spectrum; α_ν is the spectral absorption coefficient; C is a coefficient not depending on frequency; and K_ν is the spectrum of the equilibrium radiation as given by the Wien formula. Expressions for I_ν and α_ν are derived by assuming conservation of energy and momentum, and are substituted in the above equation. It is seen that Kirchhoff's law is obeyed. Thus, photon recoil in this system can be considered as a microscopic mechanism assuring observance of Kirchhoff's law. (TTT)

46300 MOLECULAR STOPPING CROSS SECTIONS OF AIR, N_2, Kr, CO_2, AND CH_4 FOR ALPHA PARTICLES. Kerr, G. D.; Hairr, L. M.; Underwood, N.; Waltner, A. W. (North Carolina Univ., Raleigh. North Carolina Univ., Chapel Hill). Health Phys., 12: 1475-80(Oct. 1966).

A method was developed to measure the stopping powers of gases for alpha particles using a semiconductor detector mounted opposite a natural source of particles in a gas chamber. By varying the gas pressure and taking an energy loss measurement at each pressure, the molecular stopping cross sections as a function of alpha particle energy were calculated. Experimental data are given for air, N_2, A, Kr, CO_2, and CH_4 for alpha particles in the energy range 300 kev to 5 Mev. The estimated probable error in the cross sections ranges from approximately 4% at the highest energies to approximately 12% at the lowest energies. (auth)

46301 MOESSBAUER EFFECT SPECTROSCOPY. Collins, Russell L. (Univ. of Texas, College Station). Ind. Res., 113-16(Oct. 1966).

The general properties of the Moessbauer effect and its many uses are briefly described. The equipment used in conjunction with obtaining Moessbauer spectra is discussed also. (M.O.W.)

46302 RESONANCES IN INELASTIC ELECTRON SCATTERING FROM H_2. Menendez, M. G.; Holt, Helen K. (National Bureau of Standards, Washington, D. C.). J. Chem. Phys., 45: 2743-4(Oct. 15, 1966).

Resonance structure in the electron scattering from H_2 was observed in two inelastic channels corresponding to excitation to the first and second vibration levels of H_2 ($X\,^1\Sigma_g^+$). An overlapping of resonances due to at least two H_2^- states lying between 11 and 13 ev is apparent. The structure in the inelastic channels is compared to the observed resonance structure in the transmission channel. The resonances are found to affect the inelastic channels more strongly than the transmission channel. The excitation function for direct vibrational excitation to the v = 1 level was measured near threshold and found to increase approximately linearly in this region. (auth)

46303 EXCITATION ENERGY IN THE NUCLEAR SPIN-SPIN INTERACTION. Duval, Eugene (Univ., Geneva). J. Chem. Phys., 45: 2855-8(Oct. 15, 1966).

Valence bond theory, Dirac's vector model, and a perturbation calculation express the coupling constant between nuclear spins as a function of exchange integrals. The approximation of mean excitation energy is not utilized. The singlet states are represented by the product of singlet functions of two electrons in one bond, or singlet functions of four electrons in two bonds, while the triplet states are represented by the product of one triplet function of two electrons in one bond, and of the preceding singlet func-

tions. The different transfer processes of the excitation from a nucleus to the other in the molecule are given. (auth)

46304 MOESSBAUER EFFECT IN COMPOUNDS OF ^{127}I. Perlow, G. J.; Perlow, M. R. (Argonne National Lab., Ill.). J. Chem. Phys., 45: 2193-2200(Sept. 15, 1966).

The Moessbauer effect of the 57.6-kev transition to the ground state of ^{127}I, which follows the β decay of ^{127m}Te, is used to measure the isomer shifts of a variety of compounds at 4.2°K. A comparison of the shifts with the quadrupole couplings in $KICl_2$, $KICl_4$, ICl, and I_2 indicates no detectable contribution from iodine s orbitals to the bonds. A shift of 0.56 mm/sec is observed per p electron removed from the closed-shell I^- configuration. With the aid of a shielding constant derived by Hafemeister, DeWaard, and DePasquali, one finds a shift of −2.8 mm/sec per s electron removed. With this, the orbital populations on iodine in IO_4^- and IO_6^{5-} are determined from their shifts. It is found that localized sp^3d^2 hybrids for the latter lead to an unreasonable charge on the iodine while a delocalized description does not demand iodine 6d orbitals and can be made to give a reasonable result. For the tetrahedrally bonded IO_4^-, either description suffices and gives an acceptable answer. It is shown that frozen aqueous hydriodic acid is highly ionic while the condensed anhydrous substance is mainly covalently bonded. The substance produced when the Te in $Te(OH)_6$ undergoes beta decay and subsequently emits the γ ray of interest is found to mainly IO_6^{5-} as shown by their relative shift. The large recoilless fractions for telluric acid and the paraperiodate ion are attributed to the large ionic charge in a simple analysis. (auth)

46305 RELATIVISTIC STATES OF POSITRONIUM AND STRUCTURE OF FUNDAMENTAL PARTICLES. Browne, P. F. (Univ. of Manchester, Eng.). Nature, 211: 810-13(Aug. 20, 1966).

An investigation was made to find a model for particle structure which would be equivalent to that of Rutherford and Bohr's for atomic structure. The particle states are distinguished from the atomic states in that they are relativistic. The various properties of the positronium system are described. It is concluded that all matter is made up of electrons and positrons. (M.O.W.)

46306 CHEMICAL CORRECTIONS TO THE MEASURED MUON MAGNETIC MOMENT. Ruderman, Malvin A. (New York Univ.). Phys. Rev. Lett., 17: 794-7 (Oct. 3, 1966).

A plausible description of the behavior of a μ^+ meson in aqueous solutions is given which suggests a reduction of almost 20 parts per million in the measured μ^+ magnetic moment. When combined with muonium hyperfine measurements it supports a value of the fine structure constant which almost halves the disagreement between theory and experiment for the hyperfine structure in hydrogen. (auth)

46307 HYDROGEN ATOM SPIN-CHANGE COLLISIONS. Smith, Francis J. (Queen's Univ., Belfast). Planet. Space Sci., 14: 929-36(Oct. 1966).

Spin-change cross sections and rate coefficients are calculated for collisions between two hydrogen atoms and for collisions between hydrogen atoms and protons taking account of nuclear symmetry. It is shown that the effect of the identity of the two nuclei is to reduce the rate at which the populations of the hydrogen spin states is changed by H-H collisions by a factor of $\frac{1}{4}$. It is also shown that the rate coefficients for spin change by e^--H collisions is 5 or 6 times larger than the rate coefficients for H^+-H collisions above about 100°K. To calculate the rate coefficients for H^+-H collisions the electron capture cross sections were calculated down to very low energies using the exact JWKB approximation for the phase shifts. Above about 10^{-2} ev these cross sections agree within a few percent with previous calculations by Bates and Boyd. (auth)

46308 SPIN CHANGE IN O–H COLLISIONS. Smith, Francis J. (Queen's Univ., Belfast). Planet. Space Sci., 14: 937-46(Oct. 1966).

The rate at which heat is lost in an interstellar cloud by O−H spin-change collisions is calculated over a range of temperatures between about 30°K and 10,000°K. Heat is lost by collisional excitation of an oxygen atom from the $^3P_2$ ground state to the $^3P_1$ or $^3P_0$ state followed by radiation back down to the ground state. It is shown that O−H spin-change is probably a faster cooling process than ion−atom spin-change at all temperatures. It is also a faster cooling process than rotational excitation of H_2 by $H-H_2$ collisions below 300°K but it is a slower process above 300°K. (auth)

46309 SPUTTERING OF MATTER BY THE BOMBARDMENT WITH URANIUM IONS. Panin, B. V.; Tel'kovskii, V. G. Soviet Phys.-Solid State (Engl. Transl.), 8: 1031-3(Oct. 1966).

Translated from Fiz. Tverd. Tela, 8: 1288-90(Apr. 1966).

A method is described for increasing the accuracy of measurement of sputtering coefficients of materials bombarded with U ions. The method eliminates inaccurate estimates of the flux of bombarding particles. Results are tabulated for bombardment of the following materials with 30-kev U ions: Cu, SiO_2, U_2O_5, ThO_2, duralumin, chromium carbide, MgO, Ta, W, stainless steel, graphite, Al_2O_3, and BeO. (A.G.W.)

46310 PHYSICAL PROPERTIES OF MANY-ELECTRON ATOMIC SYSTEMS EVALUATED FROM ANALYTICAL HARTREE-FOCK FUNCTIONS. I. NUCLEAR MAGNETIC SHIELDING CONSTANTS. Malli, Gulzari; Fraga, Serafin (Univ. of Alberta, Edmonton, Can.). Theoret. Chim. Acta, 5: 275-83(1966).

This is the first in a series of reports on the determination of physical properties of many-electron atomic systems, including nuclear magnetic shielding, diamagnetic susceptibility, electric field gradient, and nuclear quadrupole coupling constant, for all atoms and their positive and negative ions for which Hartree-Fock functions are available, as well as for the isoelectronic series. This report lists nuclear magnetic shielding constants (σ) for all the positive ions, neutral atoms, and negative ions up to krypton (Z = 36). Extrapolated values (up to Z = 106) are also presented for these systems. Comparison with previously calculated σ is made wherever such values are available. It is pointed out that the contribution to σ of an electron is independent of its orbital angular momentum quantum number but depends upon the principal quantum number of the shell, and that innermost shells make the largest contribution. (BBB)

46311 PHYSICAL PROPERTIES OF MANY-ELECTRON ATOMIC SYSTEMS EVALUATED FROM ANALYTICAL HARTREE-FOCK FUNCTIONS. II. DIAMAGNETIC SUSCEPTIBILITIES. Malli, Gulzari; Fraga, Serafin (Univ. of Alberta, Edmonton, Can.). Theoret. Chim. Acta, 5: 284-8(1966).

Diamagnetic susceptibilities (χ_d) were calculated for all positive ions, neutral atoms, and negative ions up to krypton. A table represents the diamagnetic susceptibilities of all the neutral atoms up to Z = 36, and also for Z = 42, 54, and includes, for comparison, the results of previous workers. The results agree to within 0.5% with the values calculated by Strand and Bonham for neutral atoms, up to Z = 10. This implies that the analytical fit to the Hartree-Fock (HF) potential achieved by using only a few parameters is excellent for these light atoms. However, this fit is not so satisfactory for heavier atoms. These results show that when calculating the diamagnetic susceptibility for heavier atoms there is no need to include the relativistic effects, which are dominant in the inner shells. But the functions to be used for such calculations must provide a fairly accurate description of the outer shells. As the experimental value for χ_d for Xe is in excellent agreement with the theoretically predicted value calculated in this paper using HF functions, it is evident that these functions describe adequately the electronic density at large distances from the nucleus. The inner shells give the most important contribution to the nuclear magnetic shielding constants σ; and as most of the wave functions used satisfied the cusp condition exactly, it

means that they are very accurate near the nucleus. Therefore the wave functions used in this series of calculations provide a satisfactory description of the electronic density near the nucleus as well as at large distances from it. (BBB)

46312 IONIZATION ENERGY LOSSES OF PROTONS, DEUTERONS, AND α PARTICLES. Vasilevskii, I. M.; Prokoshkin, Yu. D. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 549-55(Sept. 1966). (In Russian).

The magnetic spectrometer was used to measure the absolute stopping power of Cu for several proton energies and also for deuteron and α-particle beams. The relative stopping powers of several materials were measured on p-, d-, and α-particle beams, and the ionization potentials of these materials were obtained. (auth)

46313 FLUCTUATIONS OF IONIZATION LOSSES. Sulek, P.; Golovin, B. M.; Kulyukina, L. A.; Medved, S. V.; Pavlovic, P. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 564-6(Sept. 1966). (In Russian).

The formula for the distribution of ionization losses in thin layers, obtained previously, is specified, taking into account distant collisions of a charged particle with electrons bound in the atoms of the stopping medium. (auth)

46314 PRODUCTION OF HIGH-ENERGY NEUTRAL PARTICLES IN A LASER-SURFACE INTERACTION. Ready, J. F.; Levine, L. P.; Bernal G. E. (Honeywell Corp. Research Center, Hopkins, Minn.). 19p. (CONF-660633-6). ORAU. Gmelin, AED-CONF-66-199-3.

From American Physical Society, Division of Plasma Physics, Minneapolis, Minn.

Interaction of a high-power laser beam with an absorbing surface produces ions of high energy, up to 1000 ev per ion. Under conditions where the surface is not extensively cratered, at power densities of the order of 50 Mw/cm^2, the ions consist mainly of alkali metals and absorbed surface gases, and have energies of the order of 200 ev/ion. An observation of high energy neutral particles emitted in a laser beam-surface interaction is reported. The equipment consisted of a quadrupole mass spectrometer, ion multiplier, ion source, and laser interaction chamber. (W.D.M.)

Cosmic Radiation

See *also* Elementary Particles and Radiations
Nuclear Properties and Reactions

46315 SEARCH FOR CHARGES $^1/_3$e AND $^2/_3$e IN THE COSMIC RADIATION. Buhler-Broglin, A.; Fortunato, G.; Massam, T.; Muller, Th.; Zichichi, A. (CERN, Geneva. Univ., Bologna. Istituto Nazionale di Fisica Nucleare, Bologna. Institut de Recherches Nucleaires, Strasbourg). Nuovo Cimento (10), 45A: 520-6(Sept. 21, 1966).

The results of an experiment are presented which was planned to improve by an order of magnitude the results obtained previously in the study of the leptonic and hadronic quark composition of cosmic radiation. The experimental set-up consisted of a vertically directed telescope composed of six plastic scintillation counters and two spark chambers. Details are presented of electronic operations, calibrations, scanning, and analysis. No events were found for either $^1/_3$ e or $^2/_3$ e charge states. An improvement by a factor of ~6 and ~13 for charges $^1/_3$ e and $^2/_3$ e, respectively, was found for the 90% confidence limits for the existence of quarks in the cosmic radiation. (L.B.S.)

46316 ELECTRON-PHOTON SHOWER THEORY. Gedalin, E. V. (Inst. of Physics, Academy of Sciences, Georgian SSR). Soobshch. Akad. Nauk Gruz. SSR, 43: 569-75(Sept. 1966). (In Russian).

The mean square number of particles in three-dimensional theory of electromagnetic showers was calculated using a previously developed method involving the data on angular distribution fluctuations of particles in electron-photon showers. (R.V.J.)

46317 RECENT MATHEMATICAL DEVELOPMENTS IN CASCADE THEORY. Srinivasan, S. K. (Indian Inst. of Tech., Madras). pp 195-208 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

A new approach to cascade theory is described. Cascades for infinite thickness, solution of the mean numbers, zeros of the functions, and higher moments of the number distribution are presented. (M.O.W.)

46318 COMPARISON OF THE MEAN CHARACTERISTICS OF EXTENSIVE AIR SHOWERS WITH NUCLEAR CASCADE AVALANCHES, CALCULATED UNDER VARIOUS ASSUMPTIONS ON NUCLEON-NUCLEUS INTERACTIONS. Amineva, T. P.; Dedenko, L. G.; Nikolskii, S. I. (Lebedev Inst. of Physics, Moscow). Yadern. Fiz., 4: 578-84 (Sept. 1966). (In Russian).

Experimental data on extensive air showers are compared with calculations of nuclear cascade avalanches for three different assumptions, concerning the character of the elementary interaction act between a nucleon and a nucleus of an atom in the air. Fluctuations of the shower production height and the complex composition of the primary cosmic radiation are taken into account in calculations of the mean characteristics. Among the considered models for the nucleon—nucleus of air atoms interaction—the least disagreement with experiments is given by the two-fireball model. (auth)

46319 STUDY ON VERY-LOW-ENERGY HEAVY COSMIC RAY NUCLEI BY SLICING EMULSIONS. Fukui, Katsura (Air Force Cambridge Research Labs., Bedford, Mass.). 12p. (CONF-660411-52). ORAU. Gmelin, AED-CONF-66-060-127.

From American Physical Society Meeting, Washington, D. C.

In order to study low-energy heavy nuclei, three sheets of nuclear emulsion were exposed in a polar orbiting satellite which was launched in August, 1963. The emulsions were exposed parallel to the satellite wall of about 1.5 g/cm^2. To do flux calculations, steep tracks instead of the usual flat tracks are analyzed. The method of identifying the charge of the tracks is described briefly and the results are given. (W.D.M.)

Direct Energy Conversion

46320 (AD-628187) FLOWING GAS DISCHARGES IN POTASSIUM AND MERCURY. Final Report, April 1964-May 1965. Guderjahn, Charles A. (Atomics International, Canoga Park, Calif.). July 1, 1965. Contract AF49(638)-1222. 38p. (AFOSR-65-1914; AI-65-120). CFSTI $3.60 fs, $0.50 mn.

The resistivity of superheated potassium and mercury vapor was measured. Substantial heating of the gas by the discharge was avoided by flowing the gas through the discharge region. The resistivity of potassium gas at 7.8 torr pressure, 870K and 1 amp/sq. cm. current is 2.2 ohm-cm. The resistivity of mercury gas at 14 torr pressure, 870K and 0.67 amp/sq. cm. current is 10 ohm-cm. The resistance was primarily due to short range electron-neutral atom collisions. The cross section for this process as calculated from the resistivity is 1.5×10^{-14} sq. cm. for potassium and 2.5×10^{-14} sq. cm. for mercury. Radiation losses were neglected in this calculation. An experimental MGD device using potassium as a working fluid was constructed. Ionization was to be nonequilibrium and provided by magnetic induction. Selfsustained operation was not achieved due to internal shorting by potassium films on insulator surfaces. (auth)

46321 (AWRE-O-50/66) A PROGRAMME TO EVALUATE THE CURRENT DENSITY FROM A METAL GIVEN WORK FUNCTION, TEMPERATURE, AND ELECTRIC FIELD. McDonald, W. (Atomic Weapons Research Establishment, Aldermaston (England)). Aug. 1966. 27p. Dep. mn. BIS $0.80, HMSO 4s.

A method used to compute electron emission in an electric discharge, from the general electron emission equa-

tion, is described. Results are given in tabular and graphical form. (auth)

46322 (SC-RR-66-358) AN APPLICATION OF REENTRY THERMOCHEMISTRY TO POWER GENERATION. Touryan, K. J.; Sluyter, M. M. (Sandia Corp., Albuquerque, N. Mex.). Sept. 1966. Contract AT(29-1)-789. 35p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Theoretical and experimental analyses are presented which describe the operation and characteristics of an aerodynamic source of power from typical reentry vehicles entering the earth's atmosphere on ballistic and superorbital trajectories. (auth)

46323 GROWTH RATES FOR AXIAL MAGNETOACOUSTIC WAVES IN A HALL GENERATOR. Locke, Edward V.; McCune, James (Avco Everett Research Lab., Everett, Mass.). AIAA (Amer. Inst. Aeron. Astronaut.) J., 4: 1748-51(Oct. 1966).

The stability of one-dimensional magnetoacoustic waves traveling in the axial direction in a Hall-type MHD generator is investigated. The method of analysis is based on a linear perturbation of the quasi-one-dimensional steady-state flow equations. The dispersion relation for the wave is derived and the contributions due to $j \times B$ forces, joule heating, and flow gradients are identified. Calculations of the rate of wave growth are made for gas conditions characteristic of combustion gas and noble gas generators. (auth)

46324 COMMENTS ON THE MAXIMUM EFFICIENCY OF THERMIONIC CONVERTERS. Urbaniec, K.; Zgorzelski, M. (Warsaw Technical Univ.). J. Appl. Phys., 37: 4293(Oct. 1966).

Discrepancies between results given in two frequently quoted papers (Ingold, J. Appl. Phys., 32: 769(1961) and Schock, J. Appl. Phys., 32: 1564(1961)) on the problem of maximum efficiency of thermionic converters are discussed. It is noted that two different methods of calculation of the radiation loss in a thermionic converter were used. A calculational error is also noted in Ingold's paper, apparently in a transformation of the expression for conduction loss. Complete agreement of results is obtained by insertion of emissivity values used by Schock into corrected Ingold's equations. (A.G.W.)

46325 DISTRIBUTION OF POTENTIAL IN IONIZED GAS CHANNEL FLOW. Golodnyak, V. A.; Ustimenko, L. Yu. Magnit. Gidrodin., No. 2, 47-53(1966). (In Russian).

The distribution of potential between graphite and metallic MHD converters' electrodes in the case of nonstationary heat regime was investigated. Measurements of the induced as well as the applied electric field were carried out. The distribution of potential along the duct with sectioned electrodes was determined. (auth)

46326 CRISES IN MHD CONVERTERS. Pleshanov, A. S. Magnit. Gidrodin., No. 2, 54-6(1966). (In Russian).

Assuming the quasi-one-dimensional inviscid nonheat-conducting approximation at small values of magnetic Reynolds numbers and in the case of scalar conductivity of plasma it is shown that in linear supersonic d-c magnetohydrodynamic converters except the thermodynamical crisis corresponding to the output value of Mach number $M_* = 1$ the MHD crisis corresponding to the output values of the electrical efficiency $K_* = 1$ or $K_* = 0$ can take place. (auth)

46327 HEAT CYCLE AND OPTIMUM LOAD OF MAGNETOGASDYNAMIC CONVERTER. Pushkarev, O. E. Magnit. Gidrodin., No. 2, 57-60(1966). (In Russian).

Simple relationships for the efficiency of certain MGD converter cycles were derived. Load resistance providing the maximum efficiency was determined in the given case. (auth)

46328 THEORETICAL MODEL FOR THE ARC-MODE CESIUM CONVERTER. Ingold, J. H. (General Electric Co., Pleasanton, Calif.). 12p. (CONF-660324-6). ORAU. Gmelin, AED-CONF-66-049-3.

From 26th Annual Conference on Physical Electronics, Cambridge, Mass.

The arc-mode Cs converter is described in terms of a crude model which consists of a uniform plasma contained by potential sheaths at the electrodes. The plasma density is maintained by an elevated electron temperature which is related to the current (voltage) by an electron energy balance equation with ion losses to the electrodes being a significant sink of plasma electron energy. This equation allows a large part of the joule heating of the plasma to be returned to the emitter in the form of heat due to surface recombination of ions. The resultant electron temperatures are in rough agreement with experimentally determined temperatures. The I-V curves which result from this model behave qualitatively like those measured when parameters, e.g., electrode temperatures, electrode spacing, and Cs pool temperature are varied. (auth)

46329 CESIUM THERMIONIC CONVERTER INTERELECTRODE ELECTRON DENSITY DISTRIBUTION AS DETERMINED BY RADIATION TRANSPORT. Gelhaus, Floyd E. (Radio Corp. of America, Lancaster, Pa.); Howe, John P. 21p. (CONF-660324-7). ORAU. Gmelin, AED-CONF-66-049-1.

From 26th Annual Conference on Physical Electronics, Cambridge, Mass.

The transport of radiation is shown to be important in determining the density and spatial distribution of electrons and ions in the cesium plasma of a thermionic converter in the arc mode. Reactions used, in addition to absorption and emission of radiation by the $Cs^2P_{\frac{1}{2}}$ state, are: $2Cs(^2P_{\frac{1}{2}}) \rightarrow Cs_2^+ + e$, $Cs_2^+ + e \rightarrow Cs(^2P_{\frac{1}{2}}) + Cs(^2S_{\frac{1}{2}})$, and electron quenching and excitation of $Cs^2P_{\frac{1}{2}}$. These last reactions require consideration of a group of electrons with energy above the $^2P_{\frac{1}{2}}$ state, 1.45 ev, as well as a larger group with energy below this value. Electron and ion densities are given as a function of position, rate of excitation, and selected values of rate constants. (auth)

Elementary Particles and Radiations

See also Field Theory, Scattering Theory, and Symmetries

Refer also to abstracts 46257 and 46591.

46330 (BNL-10573) ANALYSIS OF ISOBAR PRODUCTION IN p + p AT 28.5 Bev. Connolly, P. L.; Hart, E. L.; Morris, T. W.; Panvini, R.; Rahm, D. C.; Richardson, C. R.; Thorndike, A. M. (Brookhaven National Lab., Upton, N. Y.). [1966]. Contract AT(30-2)-Gen-16. 12p. (CONF-660808-11). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 13th International Conference on High Energy Physics, Berkeley, Calif.

Experimental results are presented of a study of isobar production in p-p interactions at 28.5 Bev. The charged decays of the isobars were observed and the quantum numbers of possible resonant states were determined. In particular, the 1400 enhancement which, according to the phase shift analysis, should be a P_{11} resonance was studied. (B.G.D.)

46331 (BNL-10606) SEARCH FOR CP VIOLATION IN THE DECAY $K_S^0 \rightarrow \pi^+\pi^-\pi^0$. Hill, D. G.; Robinson, D. K. (Brookhaven National Lab., Upton, N. Y.); Cho, Y.; (and others) (Carnegie Inst. of Tech., Pittsburgh, Pa.). [1966]. Contract AT(30-2)-Gen-16. 11p. (CONF-660808-17). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 13th International Conference on High Energy Physics, Berkeley, Calif.

An experiment is described in which the neutral K is observed to decay into $\pi^+\pi^-\pi^0$ in the 15 K_S lifetimes, and is tested for large violations of CP which would lead to

comparable rates for K_S and K_L decaying into three pions. (B.G.D.)

46332 (BNL–10609) EXPERIMENTAL TEST OF THE $\Delta Q = \Delta S$ RULE IN NEUTRAL LEPTONIC K-DECAY. Cho, Y.; Canter, J. (Carnegie Inst. of Tech., Pittsburgh, Pa.); Hill, D. G.; (and others) (Brookhaven National Lab., Upton, N. Y.). [1966]. Contract AT(30-2)-Gen-16. 17p. (CONF-660808-16). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 13th International Conference on High Energy Physics, Berkeley, Calif.

Data are presented for an exposure of the 30 in. BNL chamber, filled with deuterium, to a 600 Mev/c K^+ beam at the AGS. Approximately 2.5×10^5 pictures, with an average flux of 13 K^+ per picture and an equal number of background tracks, were taken. An additional 10^5 pictures with a flux of 25 K^+ per picture and less than 10% background tracks were also taken. Neutral K's were obtained from the reaction $K^+ + d \rightarrow K^0 + p + p$. The pictures were scanned for V's independent of production origin. (B.G.D.)

46333 (COO–264-343) $K^-p \rightarrow K^-p$ DIFFRACTION AND RESONANT SCATTERING IN THE Gev REGION. Levi Setti, R.; Predazzi, E. (Enrico Fermi Inst. for Nuclear Studies, Univ. of Chicago, Ill.). Aug. 1966. Contract AT(11-1)-264. 16p. (EFINS–66-80; CONF-660808-13). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 13th International Conference on High Energy Physics, Berkeley, Calif.

An analysis of K^-p elastic scattering data from .8 to 20 Bev/c suggests that diffraction scattering contributes throughout. A model which includes resonant and diffractive effects gives a good fit to the experimental data in the 1 Bev/c region. (auth)

46334 (IS-T–96) LEPTON POLARIZATION IN PRODUCTION OF N* BY NEUTRINOS. Song, Hi Sung (Ames Lab., Iowa State Univ. of Science and Tech.). Aug. 1966. Contract W-7405-eng-82. 68p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Thesis.

The differential cross sections for the processes $\nu_l + N \rightarrow N^* + l$ and $\bar{\nu}_l + N \rightarrow N^* + \bar{l}$ are considered for a polarized outgoing lepton. The interaction Hamiltonians are expressed in terms of fourteen form factors. The spin $\frac{3}{2}$ polarization and projection operators are obtained. There are four types of terms for the differential cross sections, one depending on momentum transfer only, one proportional to $\bar{M} \cdot \hat{s}$, one proportional to $\bar{N} \cdot \hat{s}_\perp$, and one proportional to $(\bar{N} \times \bar{M}) \cdot \hat{s}$, where $\bar{N}$, $\bar{M}$, $\hat{s}$, and $\hat{s}_\perp$ are the momentum of N*, the momentum of the outgoing lepton, the unit vector along the polarization direction, and the component of $\hat{s}$ perpendicular to $\bar{M}$, respectively. Three different special cases, such as zero outgoing lepton mass, small m_M/E_M and $\bar{N}/m_N$ for the high energy neutrino beam, and transverse polarization of the outgoing lepton, are considered in order to discuss the validity of time-reversal invariance, the current-current form for the interaction Hamiltonian, and γ_5 symmetry for the lepton current. The experimental tests for these four types of terms in the differential cross sections will decide which of the above assumptions for the interaction Hamiltonian is correct. Finally, it is suggested that the consideration of the polarization cross sections might determine which set of the several sets of form factors, obtained by several authors, is the suitable one when the above assumptions for the interaction Hamiltonian are correct. (auth)

46335 (JINR–P-2871) O VOZMOZHNOSTI OBRAZOVANIYA KVARKOMOLEKUL. (On Possibility of Quark-Molecule Formation). Belyaev, V. B. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1966. 13p. Dep. mn.

A possibility is considered of the formation of molecules (similar to that of hydrogen) with quarks instead of protons. The spectrum of these systems differs from that of hydrogen molecule. (auth)

46336 (LNF-66/37) PHOTOPRODUCTION OF NEUTRAL PIONS AT 500 to 800 Mev. SEARCH FOR A "RESONANT" P_{11} AND η CUSP EFFECT. Note No. 330. Bacci, C.; Mencuccini, C.; Penso, G.; Reale, A.; Salvini, G.; Silvestrini, V.; Spinetti, M.; Stella, B. (Laboratori Nazionali di Frascati, Comitato Nazionale per l'Energia Nucleare (Italy)). July 25, 1966. 10p. Dep. mn.

Results obtained with the Frascati 1.1 Bev electronsynchrotron are reported for the reaction $\gamma + p \rightarrow \pi^0 + p$ for an incident photon energy E_γ = 450 to 850 Mev and 90, 120, and 135° cms angles. The purpose of the experiment was to collect data with p-γ coincidence method on the differential cross section at 120 and 135° in an energy region where the experimental situation is at the moment too scanty, to look for the presence of any bump or enhancement in the photoproduction cross section due to the new isobaric state P_{11} whose existence has been inferred by the results of many experiments, and to get evidence for a fine structure in the region of the second resonance (where, for instance, a cusp η effect could be present in the π^0 photoproduction amplitude due to the opening of the new (ηp) channel at E_γ = 710 Mev). (B.G.D.)

46337 (NP–16329) O RASPADE CHASTITS SO SPINOM 0 I 1 NA TRI FOTONA. (Three-Photon Decay of Particles with 0 or 1 Spin). Dolgov, A. D.; Ponomarev, L. A. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow. Institut Teoreticheskoi i Eksperimental'noi Fiziki). 1966. 8p. Dep. mn.

General form of the three photons decay amplitude of a scalar particle was obtained. The minimum power of momenta in the matrix element is seven. The general form of the vector particle decay lagrangian with the minimum power of derivatives was built. (auth)

46338 (NYO–3399-78) CURRENT ALGEBRAS, THEORY, AND APPLICATIONS. Balachandran, A. P.; Gundzik, M. G.; Nicodemi, F. (Syracuse Univ., N. Y. Dept. of Physics). Aug. 1966. Contract AT(30-1)-3399. 24p. (CONF-660638-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Conference on Particle Physics, Boulder, Colo.

An approach to current algebras which differs from those developed by Fubini and co-workers in that in the latter, one always ends up with sum rules relating physical parameters. Local statements are obtained about off-mass-shell extrapolations of scattering amplitudes and a definite set of rules for computing scattering amplitudes of a physical mass boson (pion or kaon) is developed from a knowledge of the behavior of the extrapolated amplitude in the neighborhood of the point where the four-momentum of the boson vanishes. The technique of computation is described in detail for π^+p scattering. (B.G.D.)

46339 (ORO-2504-98) AN EXPERIMENTAL DETERMINATION OF THE BRANCHING RATIO OF THE Σ^+. Technical Report No. 621. Cecil, F. E. (Maryland Univ., College Park. Dept. of Physics and Astronomy). Sept. 1966. Contract AT(40-1)-2504. 23p. Dept. mn. CFSTI $1.00 cy, $0.50 mn.

An experiment is described which was designed to determine the branching ratio $\Sigma^+ \rightarrow p + \pi^0/(\Sigma^+ \rightarrow p + \pi^0) + (\Sigma^+ \rightarrow n + \pi^+)$ utilizing a hydrogen bubble chamber exposed to a beam of stopping K^- mesons. (B.G.D.)

46340 (PUC–937-224) LONG RANGE EFFECTIVE FORCE IN NUCLEI AND THE FREE NUCLEON-NUCLEON FORCE. Kuo, T. T. S.; Brown, G. E. (Princeton Univ., N. J.). July 1966. Contract AT(30-1)-937. 8p. (CONF-660906-33). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Nuclear Physics, Gatlinburg, Tenn.

Although the free nucleon-nucleon interaction acts as a short range force, the nucleon-nucleon interaction in the nucleus contains P_2, P_4 and other long range multipole forces resulting from renormalization due to core excitations. The calculated strength of the P_2 force agrees well with that obtained empirically. The renormalization is essential in explaining important features of the observed effective forces. (auth)

46341 (SLAC–66) NEUTRON-PROTON ELASTIC SCATTERING FROM 1 TO 6.3 Gev. Kreisler, M. N.

(Stanford Linear Accelerator Center, Stanford Univ., Calif.). July 1966. Contract AT(04-3)-515. 122p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Results are presented of an experiment to measure the differential cross section of the n-p system from 1.0 to 6.3 Bev using a technique involving a neutron beam containing a broad spectrum of neutron energies, a liquid hydrogen target, and spark chambers. Experimental results are discussed for energies less than 1 Bev. Some of the present theories and models of elastic scattering are also discussed. (B.G.D.)

46342 (UCRL-2426(Vol.4)(1966 Ed.)) HIGH-ENERGY PARTICLE DATA. VOLUME IV. RANGE-MOMENTUM AND dP/dx PLOTS OF CHARGED PARTICLES IN MATTER. Trower, W. Peter (Lawrence Radiation Lab., Univ. of California, Berkeley). July 1, 1966. Contract W-7405-eng-48. 86p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Range-momentum and dP/d_x plots are presented for electron, muon, pion, kaon, proton, hyperon, deuteron, and alpha particle reactions with matter, the matter being aluminum, argon, beryllium, carbon, copper, emulsion, helium, hydrogen, lead, lithium, nitrogen, oxygen, and silver. (B.G.D.)

46343 (UCRL-11650(Rev.)) FORTRAN PROGRAM KINE: CALCULATING KINEMATICAL AND DYNAMICAL QUANTITIES FOR PARTICLE INTERACTIONS AND DECAYS. Trower, W. Peter (Lawrence Radiation Lab., Univ. of California, Berkeley). Sept. 1, 1966. Contract W-7405-eng-48. 17p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

FORTRAN program KINE is a calling routine for a collection of seven subroutines. Each subroutine calculates interesting kinematical and dynamical quantities for the particle reaction $1 + 2 \rightarrow 3 + 4$ by applying special relativity to the process in the form of the Lorentz transformation. The reaction is completely specified if, in addition to the rest masses involved, two of the physical variables are specified. The subroutines perform calculations for the most useful combinations of these two variables. (auth)

46344 (UCRL-16968) RECENT PROGRESS IN MESON AND BARYON SPECTROSCOPY. LECTURE I. RECENTLY ESTABLISHED BARYON RESONANCES. Rosenfeld, Arthur H. (Lawrence Radiation Lab., Univ. of California, Berkeley). May 1966. Contract W-7405-eng-48. 36p. (CONF-660444-1). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From International School of Symmetry of Elementary Particles, Yalta, USSR.

A report is presented on two of the most notable advances in information on baryons. One is the more complete understanding of the πp system, including the discovery that under the familiar I-spin ½ bumps at 1512 and 1688 Mev there are not one but two or three resonances. Results of phenomenologists and theoreticians on this discovery are displayed in the form of partial-wave amplitudes plotted in the complex plane (known as Argand diagrams). The other was the discovery or assignment of three states with spin 7/2. (B.G.D.)

46345 (UCRL-17087) DETERMINATION OF THE ENERGY DEPENDENCE OF THE FORM FACTOR IN K^+_{π} DECAY. Kalmus, George E.; Kernan, Anne (Lawrence Radiation Lab., Univ. of California, Berkeley). Aug. 20, 1966. Contract W-7405-eng-48. 12p. (CONF-660808-12). Dep. mn. CFSTI $1.00 cy, $0.50 mn

From 13th International Conference on High Energy Physics, Berkeley, Calif.

The decay $K^+ \rightarrow \pi^0 + e^+ + \nu$ where $\pi^0 \rightarrow 2\gamma \rightarrow 2e^{\pm}$ was studied using K^+ mesons in a heavy liquid bubble chamber. All the tracks from the decay were measured by means of the Behr-Mittner method for calculating the momenta and errors. (B.G.D.)

46346 (UCRL-17088) LOW ENERGY π-π INTERACTION STUDIES FROM K_{e4} DECAYS. Birge, Robert W.; Ely, Robert P. Jr.; Gidal, George; (and others) (Lawrence Radiation Lab., Univ. of California, Berkeley). Aug. 22, 1966. Contract W-7405-eng-48. 13p. (CONF-660808-14). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 13th International Conference on High Energy Physics, Berkeley, Calif.

Experimental results are presented on low energy (0 to 160 Mev) π-π interactions from K_{e4} decays and comparisons are made to previous results (Phys. Rev., 139: 6B, B1600(1965)). (B.G.D.)

46347 (UCRL-50101) EFFECTS OF THE ϵ^0-ρ^0 INTERFERENCE ON THE DECAY DISTRIBUTION. Csonka, P. L.; Gutay, L. J. (Lawrence Radiation Lab., Univ. of California, Livermore). July 22, 1966. Contract W-7405-eng-48. 9p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A simple and detailed calculation is presented which expresses the decay intensity angular distribution (a function of time) and the decay angular distribution in terms of the density matrix of the decaying intermediate state. (auth)

46348 (SLAC-Trans-44) THE GERMAN ELECTRON SYNCHROTRON. Experimental Program and Initial Research Results as of March 20, 1966. Meyer-Berkhout, U. (Deutsches Elektronen-Synchrotron, Hamburg (West Germany)). Translated by Benjamin Thayne for Stanford Linear Accelerator Center, Stanford Univ., Calif., from a talk given at a meeting of the Special Committee on Nuclear Physics, Bad Freudenstadt, Germany, March 24, 1966. 60p. Dep. mn. JCL $5.60 fs, $2.00 mf.

A summary is presented on the experimental program of the German Electron Synchrotron (DESY) for the years 1965 and 1966. Some of the research results are also reported. (B.G.D.)

46349 EXPERIMENTS ON THE WEAK AND STRONG INTERACTIONS. Daniel, H. (Max-Planck-Institut fuer Kernphysik, Heidelberg). At. Kozlem., 8: 139-58(June 1966). (In German).

The experiments are surveyed that were carried out in Heidelberg during the last years. Special attention is devoted to the problem of the pseudoscalar interaction and a partially conserved axial-vector current in the beta decay as well as to the question of a weak charge dependence of nuclear forces. (auth)

46350 PHOTOPRODUCTION OF AN INTERMEDIATE VECTOR MESON IN A PROTON. Bolsun, A. I.; Satsunkevich, I. S. Dokl. Akad. Nauk Belorussk. SSR, 8: 705-8 (1964). (In Russian).

The photoproduction of a vector meson on a p is studied quantitatively. A formula for the cross section of the process is given. The dependence of the cross section on the energy of the photon at $\mu = 0.5$, corresponding to a boson mass of 1.5M (M = p rest mass) and the values of the total magnetic moment 0.1 and 0.2, is shown in a graph. At $\lambda = 2$ the cross section at high energies tends to a constant value of 0.56×10^{-34} cm^2. In photoproduction on μ-mesons the correction connected with the additional term is 1% for a mass of the boson of 1.5M. (auth)

46351 EFFECT OF THE SCATTERING-MATERIAL DENSITY ON BETA-RAY BACKSCATTERING RATE. Koch, S.; Jugelt, P. (Technische Univ., Dresden). Isotopenpraxis, 2: 251-2(June 1966). (In German).

Investigations were carried out to detect the relation between the backscattering rate and the density of the scattering sample. Different geometries of measurement were used. The results demonstrate that the backscattering rate may increase, decrease, or remain constant with increasing density of the sample. The course of the curve depends on the geometry of the measurement. (auth)

46352 ELECTRIC DIPOLE MOMENTS OF BARYONS. Maekawa, Takayoshi (Kumamoto Univ., Japan). Kumamoto J. Sci., Ser. A, 6: 135-7(1965).

The electric dipole moments of baryons are discussed under the assumption of CP (or T) noninvariance using a model that the nonleptonic two-body decays of baryons can occur through the direct Yukawa interaction. Numerical values for the magnitude of the electric dipole moment are tabulated for various processes. (L.B.S.)

46353 PARTIALLY CONSERVED AXIAL-VECTOR CURRENT HYPOTHESIS FOR $\Delta S = 1$ CURRENTS. Martin, B. R. (Univ. of Copenhagen). Nucl. Phys., 87: 177-90 (1966).

The validity of the partially conserved axial-vector current hypothesis (PCAVC) for $\Delta S = 1$ currents is studied by deriving and testing a consistency condition for K^+p scattering. The condition is almost certainly incompatible with experiment. Confirmatory evidence from K_{e4} decay for this implied breakdown of the PCAVC hypothesis for $\Delta S = 1$ currents is considered, and some recent calculations using PCAVC and current algebras briefly re-examined. In particular, it is concluded that the SU(3) mixing parameter α cannot be reliably calculated by these methods. (auth)

46354 THE SELF-CONSISTENT DETERMINATION OF THE VERTEX FUNCTION AND THE MANDELSTAM REPRESENTATION. Dubec, M.; Noga, M. (Univ. Komenskeho, Bratislava). Nucl. Phys., 87: 191-7(1966).

A solution is given to the problem of whether the double dispersion relations for the scattering amplitude are compatible with the dispersion relations for form factors on the basis of the bootstrap dynamics. This problem is illustrated by the well-investigated πN scattering. the self-consistent method is used to calculate the πNN vertex function, especially to determine the thresholds of its spectral representation. The determined thresholds are in total agreement with the unitarity condition. (auth)

46355 CALCULATION OF PION-NUCLEON P_{11} PHASE SHIFTS. Mallik, Samir; Roy, Salil (Saha Inst. of Nuclear Physics, Calcutta). Nucl. Phys., 87: 198-200(1966).

Froissart's method of reducing a multichannel problem into an equivalent single-channel problem was adopted for the calculation of the P_{11} phase shift in π-N scattering. The result shows qualitative agreement with experiment. (auth)

46356 INELASTIC INTERACTIONS OF COSMIC RAY PARTICLES WITH ATOMIC NUCLEI AT VERY HIGH ENERGIES. Artykov, I. Z.; Barashenkov, V. S.; Eliseev, S. M. (Joint Inst. for Nuclear Research, Dubna, USSR). Nucl. Phys., 87: 241-55(1966).

The nucleon-nucleus interactions in the energy range T = 100–1000 Bev are analyzed from the point of view of the mechanism of intranuclear cascades in its generally accepted form (as a series of independent two-particle interactions). According to the presently available experimental data, it was taken into account that among secondary particles produced in high-energy inelastic nucleon-nucleon and pion-nucleon collisions there is a leading particle carrying away about 70% of the total energy. Consideration of this fact leads to the result that the cascade calculation is strongly contradictory with the experimental data. To obtain agreement between theory and experiment it is necessary, in the calculation of the intranuclear cascades, to take into consideration many-particle interactions of fast particles inside the nucleus. A change in the usual form of the cascade mechanism of nucleon-nucleus interactions occurs at an energy of several dozens of Bev. (auth)

46357 ELECTROPRODUCTION OF PIONS FROM DEUTERONS. Devanathan, V. (Univ. of Virginia, Charlottesville). Nucl. Phys., 87: 256-66(1966). (ORO-2915-50).

The inelastic scattering of electrons by deuterons resulting in pion production is studied using the impulse approximation. For calculational purposes, the amplitude for the production from a single nucleon is taken from the work of Fubini, Nambu and Wataghin. Since in the experimental arrangement, only the final electron is observed, a summation has to be made over the final dinucleon states and an integration over the pion direction. The charge and magnetic moment form factors determined from electron scattering experiments by Hofstadter are used in the present numerical computation. The cross sections obtained for the electroproduction of pions from deuterons are compared with the experimental results of Ohlsen and also the ratio of the deuteron to the proton cross section is estimated. (auth)

46358 COVARIANT ANALYSIS OF QUARK COMMUTATORS AND ELECTROMAGNETIC COUPLINGS. Patsakos, G. (Stanford Univ., Calif.); Segre, G.; Walecka, J. D. Phys. Lett., 23: 141-2(Oct. 10, 1966).

Using commutators of integrated quark currents, dominance of matrix elements of divergences by one-meson poles, and saturation of the sum rules by low-lying particles and resonances electromagnetic meson decays are related to properties of the nucleon. (auth)

46359 DETERMINATION OF THE NYK COUPLING CONSTANTS. Zovko, N. (Inst. Ruder Boskovic, Zagreb). Phys. Lett., 23: 143-5(Oct. 10, 1966).

Zeros of the antisymmetric combination of the $K^{\pm}p$ forward amplitudes are considered and the dispersion relation for the inverse amplitude is used for the estimation of the NYK coupling constants: $G_\Lambda^2 = 6.8 \pm 2.9$, $G_\Sigma^2 = 2.1 \pm 0.9$. (auth)

46360 ANALYSIS OF THE $K^- + p \rightarrow \Sigma^- + \pi^+$ REACTION FROM 1.7 TO 2.0 Gev/c. Dauber, P. M.; Schlein, P. E.; Slater, W. A.; Stork, D. H.; Ticho, H. K. (Univ. of California, Los Angeles). Phys. Lett., 23: 154-7(Oct. 10, 1966).

The $K^-p \rightarrow \Sigma^-\pi^+$ differential cross section is investigated at 1.80 and 1.95 Bev/c incident momentum. The cross section changes rapidly. It is shown that the variation is consistent with the existence of a $J = 5/2$ Y^* at 2.15–2.22 Bev with $\Gamma \simeq 50$ to 80 Mev. (auth)

46361 SLOPE OF DIFFERENTIAL CROSS SECTION FOR INELASTIC PROCESSES AT 12 Gev/c π^-p INTERACTION. Chikovani, G.; Dubal, L.; Focacci, M. N.; Kienzle, W.; Lechanoine, C.; Levrat, B.; Maglic, B. C.; Martin, M.; Nef, C.; Schuebelin, P. (CERN, Geneva). Phys. Lett., 23: 157-60(Oct. 10, 1966).

The dependence on t of $d\sigma/dt$ is studied for the processes $\pi^-p \rightarrow pMM^-$ at 12 Bev/c and $0.26 < |t| < 0.37$ $(Bev/c)^2$. (auth)

46362 FURTHER RESULTS ON THE CHARGE EXCHANGE $\bar{p}p \rightarrow \bar{n}n$ AT 5, 6, 7, AND 9 Gev/c. Astbury, P. (CERN, Geneva); Brautti, G.; Finocchiaro, G.; (and others). Phys. Lett., 23: 160-3(Oct. 10, 1966).

Data are presented on the total and differential cross sections at 5, 6, 7, and 9 Bev/c for the reaction $\bar{p}p \rightarrow \bar{n}n$. The results are compared with the Regge-pole and the coherent droplet models. (auth)

46363 DETERMINATION OF AN UPPER LIMIT FOR THE PARTIAL WIDTH $\Gamma(\rho\pi\gamma)$. Fidecaro, G.; Fidecaro, M.; Poirier, J. A.; Schiavon, P. (CERN, Geneva). Phys. Lett., 23: 163-6(Oct. 10, 1966).

An experiment to measure the partial width $\Gamma(\rho\pi\gamma)$ is described. An upper limit was obtained. (auth)

46364 K_L-K_S REGENERATION PHASE AND THE RELATIVE PHASE OF THE AMPLITUDES FOR THE DECAY OF K_L AND K_S INTO π^+ AND π^-. Rubbia, C. (CERN, Geneva); Steinberger, J. Phys. Lett., 23: 167-70(Oct. 10, 1966).

In a previous experiment the difference $\varphi_{\eta_{+-}} - \varphi_f$ of the CP violation phase in $K \rightarrow \pi^+\pi^-$ and regeneration phase was found to be 1.41 ± 0.18. Using nuclear-scattering data of Cool et al., and the regeneration intensity, $\varphi_f = -0.81 \pm 0.14$ is found. In this way the phase of η_{+-} alone is: $\varphi_{\eta_{+-}} = (0.60 \pm 0.23)$ sign Δm. This value is in agreement with the prediction of the "superweak" model of CP violation: $\varphi_{\eta_{+-}(\text{superweak})} = (0.72 \pm 0.04)$ sign Δm. (auth)

46365 K^--p ELASTIC SCATTERING AT 5.5 AND 4.1 Gev/c. Mott, J. (Northwestern Univ., Evanston, Ill.); Ammar, R.; Davis, R.; (and others). Phys. Lett., 23: 171-4(Oct. 10, 1966).

The absolute differential cross sections for K^--p elastic scattering at 5.5 Bev/c and 4.1 Bev/c were measured. Results are presented based on about 2,000 events at each momentum. (auth)

46366 RECOIL PROTON POLARIZATION IN ELASTIC π^-p SCATTERING AT 300 Mev AND THE PHASE SHIFT ANALYSIS OF PION-NUCLEON SCATTERING. Vasilev-

skii, I. M.; Vishnyakov, V. V.; Ivanchenko, I. M.; Lapidus, L. I.; Silin, I. N.; Tyapkin, A. A.; Schegelskii, V. A. (Joint Inst. for Nuclear Research, Dubna, USSR). Phys. Lett., 23: 174-6(Oct. 10, 1966).

The results of a measurement of recoil proton polarization for $\pi^-p \to \pi^-p$ at 300 Mev are given, and a phase shift analysis is made with the help of other data. (auth)

46367 REGGE-POLE CONTRIBUTION TO ω^0-PHOTOPRODUCTION. Drechsler, W. (Univ., Heidelberg). Phys. Lett., 23: 272-4(Oct. 24, 1966).

The ω^0-photoproduction near threshold is calculated in the Regge-pole model and compared to recent experimental data from DESY. (auth)

46368 INTERFERENCE OF K_L^0 AND K_S AMPLITUDES IN THE $\pi^+\pi^-$ DECAY MODE. Bott-Bodenhausen, M.; De Bouard, X.; Cassel, D. G.; (and others) (CERN, Geneva). Phys. Lett., 23: 277-80(Oct. 24, 1966).

The decay law of a coherent mixture of K_L^0 and K_S^0 was measured over nine K_S^0 mean lives in the $\pi^+\pi^-$ mode. The relative phase between the interfering amplitudes was found to be $\varphi_{\eta_{+0}} - \varphi_{1f\,21} = (1.54 \pm 0.17)$ sign $(m_L - m_S)$ rad and the $K_L^0 - K_S^0$ mass difference $|\Delta m/\Gamma_S| = 0.480 \pm 0.024$. (auth)

46369 MASS DIFFERENCE ON THE NEGATIVE AND NEUTRAL PIONS. Vasilevskii, I. M.; Vishnyakov, V. V.; Dunaitsev, A. F.; Prokoshkin, Yu. D.; Rykalin, V. I.; Tyapkin, A. A. (Joint Inst. for Nuclear Research, Dubna, USSR). Phys. Lett., 23: 281-2(Oct. 24, 1966).

The angular correlation of gamma-quanta emitted in the capture of stopping π^--mesons by protons was measured. Measurements were made with a hodoscope of scintillation and gas discharge counters. The mass difference of the negative and neutral pions turned out to be (4.6034 ± 0.0052) Mev/c^2. (auth)

46370 π^+-MESON DECAY CURVE IN THE REGION OF LARGE LIFETIMES. Dunaitsev, A. F.; Kutyin, V. M.; Prokoshkin, Yu. D.; Rasuvaev, E. A.; Simonov, Yu. N. (Inst. of High Energy Physics, Serpukhov, USSR). Phys. Lett., 23: 283-5(Oct. 24, 1966).

π^+-meson decay curve ($\pi^+ \to \mu^+ + \nu$) was measured by means of a scintillation counter system and a high-speed multi-ray oscilloscope. The trap for positrons being used, the background resulting from the $\mu^+ \to e^+$ decay was reduced to the level 3×10^{-6}. The decay curve was followed up to 16 τ (where τ is the main lifetime of π^+-meson), no deviation from the exponential law was observed. (auth)

46371 DIRECT EVIDENCE FOR THE DECAY MODE $\omega^0 \to \pi^0\gamma$. Baglin, C. (Ecole Polytechnique, Paris); Bezaguet, A.; Degrange, B.; Jacquet, F.; Kurz, R. J.; Musset, P.; Nguyen-Khac, U.; Haatuft, A.; Halsteinlid, A.; Olsen, J. M. Phys. Lett., 23: 286-8(Oct. 24, 1966).

A study of neutral decay modes of ω^0 is performed using the production reaction $\pi^+ + p \to \pi^+ + p + \omega^0$. The directions and momenta of charged tracks and gamma rays are measured. The results give direct evidence for the decay of ω^0 into $\pi^0\gamma$. (auth)

46372 COUPLED-CHANNEL, SEVERAL-FORCE MODEL FOR A BARYON ANTIDECUPLET. Brehm, J. J.; Kane, G. L. (Summer Inst. for Theoretical Physics, Seattle). Phys. Rev. Lett., 17: 764-6(Oct. 3, 1966).

Predictions of dynamical calculations for the systems K^+p and K^+d are examined in some detail. It is found that baryon exchange and inelastic coupling must be considered and yield a resonant 10^* SU(3) multiplet with $J^P = \frac{1}{2}^+$ in the mass range 1.5 to 2 Bev. (J.F.P.)

46373 PHOTOPRODUCTION OF MUON PAIRS: A TEST OF QUANTUM ELECTRODYNAMICS. DePagter, J. K. (Cambridge Electron Accelerator, Mass.); Friedman, J. I.; Glass, G.; Chase, R. C.; Gettner, M.; von Goeler, E.; Weinstein, Roy; Boyarski, A. M. Contract AT(30-1)-2098. Phys. Rev. Lett., 17: 767-72(Oct. 3, 1966).

An experiment on the photoproduction of meson (μ) pairs from carbon was performed using a 5.2-Bev bremsstrahlung beam. A considerably expanded selection of data is compared with the predictions of quantum electrodynamics. It is concluded that the behavior of the meson (μ) pair production is not compatible with the electron pair results interpreted as a function of q_e^2 or as k^2, where q is the four momentum transferred to the electron and k is the gamma energy, if the Harvard ratio is set equal to 1.0 in the low-energy limit. The experiment indicates that the meson (μ) is better described by quantum electrodynamics or at least by the Bethe-Heitler theory in kinematic range. But there is an indication, in the meson (μ) results, of a deviation about eight times smaller than the deviation in the electron experiments and of opposite sign. (J.F.P.)

46374 $K \to 2\pi$ DECAY AND SU(3) SYMMETRY. Boulware, David G.; Brown, Lowell S. (Univ. of Washington, Seattle). Phys. Rev. Lett., 17: 772-3(Oct. 3, 1966).

It is shown that two-meson (π) decay modes of the meson (K) remain forbidden in the limit of exact SU(3) symmetry if the requirement of octet dominance is relaxed and the decay hamiltonian is allowed to contain a part that transforms like the 27-dimensional representation. It is noted that the observed decay rates may be attributed principally to the large K-π mass difference, which can give rise to a large kinematical SU(3) breaking of otherwise symmetrical amplitudes. (J.F.P.)

46375 SEARCH FOR QUARKS IN THE FAR ULTRAVIOLET SOLAR SPECTRUM. Sinanoglu, O. (Yale Univ., New Haven); Skutnik, B.; Tousey, R. Phys. Rev. Lett., 17: 785-8(Oct. 3, 1966).

The sharp emission lines in the range 200 to 1700 Å originate from regions of the sun where quarks may be found mainly as bound to the nuclei of carbon, nitrogen, and oxygen. Electronic transitions of such species are predicted and a search is carried out in the far uv solar spectrum. (auth)

46376 PRODUCTION OF THE NUCLEON ISOBARS 1236, 1410, 1518, AND 1688 Mev IN PROTON-PROTON COLLISIONS AT 2.85, 4.55, 6.06, AND 7.88 Gev/c. Blair, I. M. (Atomic Energy Research Establishment, Harwell, Eng.); Taylor, A. E.; Chapman, W. S.; Kalmus, P. I. P.; Litt, J.; Miller, M. C.; Scott, D. B.; Sherman, H. J.; Astbury, A.; Walker, T. G. Phys. Rev. Lett., 17: 789-93 (Oct. 3, 1966).

Momentum spectra of protons scattered inelastically in proton-proton collisions were obtained in an external beam using incident proton momenta of 2.85, 4.55, 6.06, and 7.88 Bev/c and various scattering angles in the range 22 to 144 mrad. There is evidence for the production of the 1410 Mev isobar at small angles. The well-known isobars of mass values 1236, 1518, and 1688 Mev are also seen. The differential cross sections are presented for the production of these isobars. They are analyzed in terms of the usual variables s and t. Fits to the observed momentum spectra indicate for the N*(1410) a mass of 1410 ± 15 Mev and a width of 125 ± 20 Mev. (auth)

46377 LARGE-ANGLE ELASTIC SCATTERING AT HIGH ENERGIES. Hagedorn, R. (CERN, Geneva). pp 41-53 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

Proton elastic interactions below 30 Bev are considered. The equation: $d\sigma_{el}/dt = (d\sigma_{el}/dt) \cdot F(t)(S/2m^2)^{2[\alpha(t)-1]}$ is derived and its invalidity for large angles is shown. Also, the statistical model is applied to the large-angle elastic scattering. (J.F.P.)

46378 CROSSING RELATIONS AND SPIN STATES. Jacob, M. (MATSCIENCE, Madras). pp 55-62 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

Conservation of parity and time reversal invariance are used to reduce the number of independent p-p amplitudes to five. In the crossed p-$\bar{p}$ channel parity conservation and charge conjugation invariance are used. Meson (π^-)-nucleon scattering is also considered. (J.F.P.)

46379 EFFECTIVE-RANGE APPROXIMATION BASED ON REGGE POLES. Udgaonkar, B. M. (Tata

Inst. of Fundamental Research, Bombay). pp 87-93 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

It is shown how singularities in the complex momentum plane can be used to provide a good description of low-energy n-p scattering. The expression obtained has no arbitrary constants and gives reasonably good agreement with experimental data. The effect of reggeizing the nucleon was to cut down its contribution even at threshold compared to what it is when treated as an ordinary particle. (J.F.P.)

46380 THE SU(6) SYMMETRY AND THE ELECTROMAGNETIC MASS-DIFFERENCES OF $^3/_2^+$ BARYONS. Yang, Guo-zheng. Wu Li Hsueh Pao, 22: 253-6(Feb. 1966). (In Chinese).

The $^1/_2^+$ and $^3/_2^+$ baryon magnetic moments, predicted by the SU(6) symmetry are used in the Feynman and Speisman method, taking into consideration the intermediate minimum mass form, involving one $^1/_2^+$ baryon and a proton, for evaluating the magnetic mass of the $^3/_2^+$ baryon. The intermediate maximum mass form correction, one $^3/_2^+$ and one photon, was also roughly explored, thus allowing one to evaluate indirectly the magnetic moment predicted by the SU(6) symmetry and the magnetic moment of the $^3/_2^+$ baryon, predicted by the SU(3) symmetry. After making several simplifying assumptions, it was found that the correction term related to the intermediate form of the $^3/_2^+$ baryon depends only on the electric charge. It is pointed out that the theory of the SU(6) symmetry has only a limited validity: it is nonrelativistic and it deals only with interactions between charge and charge or magnetic pole and magnetic pole. (TTT)

46381 MEASUREMENT OF THE PARAMETER R IN THE ELASTIC pn-SCATTERING AT 605 Mev AND THE NUCLEON-NUCLEON PHASE SHIFT ANALYSIS. Kazarinov, Yu. M.; Legar, F.; Pisarev, A. F.; Simonov, Yu. N.; Yanout, Z. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 567-77(Sept. 1966). (In Russian).

The triple scattering parameter R_{pn} and the polarization P_{pn} in pn-scattering at 90 and 125° (cms) were measured at 605 Mev. The measurements were performed using spark chambers. The polarization power of the analyzers and "instrumental parameters" were determined experimentally. Corrections for geometric distortions due to the track photographing system are taken into account. The values were found to be: $R_{pn}(90°) = 0.50 \pm 0.11$, $P_{pn}(90°) = -0.07 \pm 0.06$, $R_{pn}(125°) = -0.06 \pm 0.28$, $P_{pn}(125°) = -0.44 \pm 0.16$. Three previously known phase-shift sets at 630 Mev were specified. It is shown that one of the sets can be excluded on the basis of the new data. (auth)

46382 INELASTIC NEUTRINO PROCESSES IN THE SU(3)-SYMMETRY. Zakharov, V. S. (Inst. of Theoretical and Experimental Physics, State Atomic Energy Commission, USSR). Yadern. Fiz., 4: 603-8(Sept. 1966). (In Russian).

It is shown, that the matrix elements of the strangeness-changing hadron vector current divergences transform according to the octet representation, in the first order with respect to the SU(3) violation. This result can be checked in experiments, analogous to those suggested by Adler to verify the conserved vector current hypothesis. (auth)

46383 COLLINEAR MESON PRODUCTION PROCESSES IN NEUTRINO-NUCLEON INTERACTIONS AND THE $SU(6)_w$-SYMMETRY. Rekalo, M. P. Yadern. Fiz., 4: 609-14(Sept. 1966). (In Russian).

The W-spin formalism is used to investigate collinear meson production processes in neutrino-proton interactions. Consequences of the $SU(6)_w$-symmetry for the amplitude of meson production by longitudinal and transversal lepton current components were analyzed. The most interesting relations between amplitudes, following from the $SU(6)_w$-symmetry are listed. (auth)

46384 RECONSTRUCTION OF THE REACTION AMPLITUDE FOR THE PRODUCTION OF A VECTOR MESON $\pi + N \rightarrow N + \omega(\rho)$. Nhuong, Doan (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 636-40(Sept. 1966). (In Russian).

The complete set of experiments is considered, necessary for the direct reconstruction of the reaction amplitude for the production of a vector meson $\omega(\rho)$. It is shown that these experiments concern polarization effects for the target and recoil nucleon and the vector meson. (auth)

46385 ON THE CREATION OF AN ω^0-MESON IN THE COULOMB FIELD OF A NUCLEUS. Kelner, S. R. (Moscow Inst. of Engineering Physics). Yadern. Fiz., 4: 641-5 (Sept. 1966). (In Russian).

The spin structure of the amplitude for the production of an ω^0 meson by a π-meson in the Coulomb field of a nucleus at large energies is analyzed. It is assumed that at $s \rightarrow \infty$ all helicity amplitudes in the t-channel depend on s in the same way. The polarization parameters of the ω^0-meson are calculated. (auth)

46386 CONSTRUCTION OF THE MESON-NUCLEON SCATTERING MATRIX IN EXPERIMENTS WITH A POLARIZED TARGET. Bilenkii, S. M.; Ryndin, R. M. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 646-52(Sept. 1966). (In Russian).

Relativistic formulas are obtained for the reconstruction of the meson-nucleon scattering matrix from experimental data at a fixed angle and energy (including experiments with a polarized proton target). Pion-nucleon scattering is discussed. Relativistic formulas are obtained for the reconstruction of amplitudes with the total isospin $^3/_2$ and $^1/_2$. (auth)

46387 NONLEPTONIC WEAK INTERACTIONS AND ELEMENTARY PARTICLE SYMMETRIES. Rosen, S. P. (Purdue Univ., Lafayette, Ind.). 20p. (CONF-660411-54). ORAU. Gmelin, AED-CONF-66-060-132.

From American Physical Society Meeting, Washington, D. C.

Nonleptonic weak interactions are studied from the pure symmetry approach and the current × current theory. The transformation properties are investigated under the $\Delta T = ^1/_2$ rule in isospace, the octet representation in SU(3), and the (35)-rule in SU(6). The Suzuki-Sugawara theory of parity violating decay and parity conserving decay in the pole model is analyzed. A brief discussion is also given on the vanishing asymmetry parameters in $\Sigma^\pm \rightarrow n\pi^\pm$. (L.B.S.)

Field Theory, Scattering Theory, and Symmetries

See also Elementary Particles and Radiations

Refer also to abstracts 46499, 46502, and 46505.

46388 (ANL-7173) LECTURES ON REGGE POLES AND THEIR PHENOMENOLOGICAL APPLICATION IN HIGH-ENERGY PHYSICS. Arnold, R. C. (Argonne National Lab., Ill.). Feb. 1966. Contract W-31-109-eng-38. 70p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

These lectures were divided into two parts. In one part the bound states and scattering from a nonrelativistic, potential-theory viewpoint are discussed. Regge poles are introduced as generalizations of bound states and scattering resonances. Regge trajectories are discussed as aids in classifying spectra of complex two-body systems with many bound or resonance states. A classification of presently known, strongly interacting particles and resonances is exhibited to the extent that data on the spectrum are presently available. In the second part, crossing relations and the Sommerfeld-Watson transform are employed to discuss the influence of Regge poles on low-momentum transfer, high-energy reactions in crossed channels. Phenomenological analyses of data from selected two-body reactions are discussed, and successes and failures of simple Regge-pole models are explicated. Peripheral models for inelastic reactions are treated as special cases.

Finally, a (presently) semiphenomenological optical-model framework, including as a special case the absorptive correction method, is briefly described as an example of a more general approach to high-energy reactions in which the Regge poles appear as an approximation valid in the empirically successful cases described above. (auth)

46389 (ANL-7216) CONJUGACY TO UNITARY GROUPS WITHIN THE INFINITE-DIMENSIONAL SYMPLECTIC GROUP. Segal, Irving E. (Argonne National Lab., Ill.). June 1966. Contract W-31-109-eng-38. 11p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The characterization of Cook for stable, amenable, symplectic groups in an infinite-dimensional space is sharpened and reformulated so as to be applicable in part to arbitrary groups. (auth)

46390 (NYO-3399-77) DYNAMICAL GROUP OF A SIMPLE PARTICLE MODEL. Boehm, A. (Syracuse Univ., N. Y. Dept. of Physics). Aug. 1966. Contract AT(30-1)-3399. 15p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The description of physical systems by dynamical groups is very likely to be equivalent to the usual quantum mechanical description. Assuming this equivalence the physical system of a strongly interacting particle is examined by the enveloping algebra of a dynamical group which is connected with the question as to whether or not the usual quantum mechanical laws alone govern this physical system. (B.G.D.)

46391 (UCRL-17068) STUDY OF BRANCH POINTS IN THE ANGULAR MOMENTUM PLANE. Rothe, Heinz J. (Lawrence Radiation Lab., Univ. of California, Berkeley). Aug. 24, 1966. Contract W-7405-eng-48. 123p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

A study is made of the Amati-Fubini-Stanghellini (AFS) type of approximation to the amplitudes associated with the exchange of a single Regge pole and an elementary spinless particle, and of two Regge poles, respectively. The location, motion, and nature of the singularities in the complex angular momentum plane of the s reaction which appear in these approximations, and their cancellation in the full diagram, are considered in detail; the singularities are found to be of two general types: branch points whose positions are independent of particle masses, and those which depend on them. Only the former ones determine the asymptotic behavior of the AFS amplitudes in the physical scattering region, while the latter singularities appear only on the physical sheet via the mass-independent branch points at unphysical momentum transfers. The same method used in the study of the AFS approximation to the diagrams which do not have the AFS-type singularities is applied to the analysis of the Mandelstam diagrams for which the above-mentioned cancellation of the cuts does not occur. The analysis, although less rigorous, suggests that the location and nature of the singularities in the j plane are the same as those found for the AFS type of approximations to their simpler versions. With a number of approximations which, although plausible, are hard to justify rigorously, an estimate is made of the relative contributions to the amplitude coming from the angular momentum cut and the corresponding Regge pole. (auth)

46392 (UCSD-10P10-9) COMPARISONS BETWEEN ON-SHELL AND OFF-SHELL METHODS FOR THE TWO-BODY T-MATRIX. Marchesini, G. (Milan Univ. (Italy); Wong, D. Y. (California Univ., La Jolla, San Diego). Aug. 1966. Contract AT(11-1)-Gen-10. 11p. (CONF-660808-15). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 13th International Conference on High Energy Physics, Berkeley, Calif.

The nonrelativistic Low equation is extended to include the relativistic phase space factor and to allow a general velocity dependent potential. A method for solving the Low equation is derived and applied to NN, $N\bar{N}$, and $\pi\pi$ scattering problems. The results are compared to the solutions of the on-shell ND^{-1} equations. (B.G.D.)

46393 PARTICLE-ANTIPARTICLE REALIZATIONS FOR MIXED IRREDUCIBLE REPRESENTATIONS OF UNITARY GROUPS. Leal Ferreira, P.; Castilho Alcaras, J. A.; Aguilera Navarro, V. C. (Instituto de Fisica Teorica, Sao Paulo, Brazil). An. Acad. Brasil. Cienc., 37: 419-24(1965).

Realizations of the basic states for irreducible representations of U_n are given for the cases of both positive and negative highest weights (mixed representations) in terms of two sets of fermion creation operators for particles and antiparticles. (auth)

46394 FORMULATION OF MODELS FOR THE ELASTIC SCATTERING AMPLITUDE USING THE ND^{-1} METHOD. Castoldi, P. (Univ. Libre, Brussels). Nucl. Phys., 87: 209-31(1966). (In French).

The ND^{-1} equations for the elastic scattering of two identical particles without spin are written under the hypothesis that the partial wave amplitude satisfies a dispersion relation with one subtraction. The N and D functions satisfy a set of two coupled singular integral equations and depend on the left hand discontinuity and on the inelasticity factor. These quantities are the basic parameters for model theories, and if they satisfy suitable asymptotic conditions, the solution of the ND^{-1} equations exists and is unique. The asymptotic behavior of the real part of the phase shift is studied and gives a possible generalization of Levinson's theorem. Some simple models are examined, which illustrate various points of the method. (auth)

46395 COMPLETENESS, UNITARITY, AND DISPERSION RELATIONS IN POTENTIAL SCATTERING. Saavedra, I. (IAEA, Trieste, Italy). Nucl. Phys., 87: 267-72 (1966).

It is shown that the assumption of completeness of the set of scattering states implies the unitarity condition for the total scattering amplitude and dispersion relations for the S-matrix for each value of the angular momentum. (auth)

46396 QUASI-PARTICLE TRIPLES AS EXACT SOLUTIONS FOR A LEE-TYPE MODEL. Wohlrab, K. S. (Joint Inst. for Nuclear Research, Dubna, USSR). Phys. Lett., 23: 111-12(Oct. 10, 1966).

A soluble model in which quasi-particle "triples" exist in the ground state is proposed. (auth)

46397 DISPERSION SUM RULES AND SU(3) SYMMETRY. Matveev, V. A.; Struminskii, B. V.; Tavkhelidze, A. N. (Joint Inst. for Nuclear Research, Dubna, USSR). Phys. Lett., 23: 146-8(Oct. 10, 1966).

The sum rules based on the unsubtracted dispersion relations without any current algebra were studied in the framework of SU(3) symmetry. The possible modification of the dispersion sum rules by adding subtractions was considered. (auth)

46398 HIGH ENERGY THEOREMS FOR TOTAL CROSS SECTIONS FROM A CURRENT ALGEBRA. Moffat, J. W. (Univ. of Toronto). Phys. Lett., 23: 148-51 (Oct. 10, 1966).

An extended version of the Pomeranchuk theorem and certain relations between total off-mass-shell cross sections for various processes at high energies are derived from a subalgebra of SU(6). It is predicted that $\sigma_p^{\pi^+} - \sigma_p^{\pi^-} = \text{const.}/\nu_L$, as $\nu_L \to \infty$ where const. > 0. The relations between the total cross sections reduce to the high energy Johnson-Treiman relations in the exact symmetry limit. (auth)

46399 BOSON DESCRIPTION OF FERMION SYSTEMS. Soerensen, B. (NORDITA, Copenhagen). Phys. Lett., 23: 274-6(Oct. 24, 1966).

The convergence of boson expansions of fermion pair operators as first suggested by Beliaev and Zelevinsky is discussed and comparison is made with exact solution for four particles in a degenerate $j = 15/2$ shell interacting via pairing plus quadrupole force. (auth)

46400 THEORY OF THE REACTION n + d → n + n + p. Aaron, R. (Goddard Space Flight Center, Greenbelt, Md.); Amado, R. D. Phys. Rev., 150: 857-66(Oct. 21, 1966).

The proton energy spectrum at various angles for the process n + d → n + n + p at 14.4-Mev incident-neutron laboratory energy was calculated using an exact three-

body theory with separable, S-wave, spin-dependent, two-body forces. The major features of the experimental data are reproduced, but not the precise magnitudes. The integral equations solved are quite singular and it was found to be necessary to deform the integration path. This involves the careful treatment of some branch points. The results are not good enough to resolve the problem of the neutron-neutron scattering length, but by comparing Watson theory with our exact calculations we show that Watson theory is inadequate in this problem. (auth)

46401 MEANING AND RELIABILITY OF SOME THREE-BODY CALCULATIONS. Basdevant, J. L.; Omnes, R. L. (Brookhaven National Lab., Upton, N. Y. Institut de Recherches Nucleaires, Strasbourg). Phys. Rev. Lett., 17: 775-8(Oct. 3, 1966).

The range of applicability of models for three-body calculations and some of their important qualitative features are considered. The discussion includes practical limitations of the separable pole approximation, the influence of the Peierls singularities, and spurious singularities at s = 0. (J.F.P.)

46402 PARTIAL CONSERVATION OF AXIAL-VECTOR CURRENT AND CHIRAL REPRESENTATION MIXING. Horn, D. (Argonne National Lab., Ill.). Phys. Rev. Lett., 17: 778-82(Oct. 3, 1966).

Partial conservation of axial vector current is used to evaluate the axial transition amplitudes from known π coupling constants. In this way the data obtained from strong interactions are analyzed and compared with the group theoretical predictions. As a test this is applied to mixing schemes, for baryons and it is also applied to mesons. (J.F.P.)

46403 FEYNMAN DIAGRAMS IN STATISTICAL PHYSICS. Bialynicki-Birula, Iwo (Univ. of Warsaw). Postepy Fiz., 17: 359-74(1966). (In Polish).

A simple derivation of the Feynman diagram method in statistical physics of systems at zero and finite temperatures is given. The derivation is based directly on equations for the Green functions. The linked cluster expansion and the boundary conditions for the Green functions are also briefly discussed. (auth)

46404 REGGE TRAJECTORIES FOR COULOMB POTENTIAL CUTS. Virasora, Miguel A. (Facultad de Ciencias Exactas y Naturales, Buenos Aires). Rev. Union Mat. Argent. Asoc. Fis., 22: 155-67(1965). (In Spanish).

The Coulomb potential cut at zero and at infinity is studied. Regge's poles are obtained for the energy tending to infinity and to zero. It can be verified in this way that the behavior for high energies is determined by the potential values for short distances, while the behavior for low energies is determined by the potential values for large distances. General arguments are also given that demonstrate such a statement and that allow anticipation of the shape of the trajectories for the different potentials considered. (auth)

46405 ASYMPTOTIC OF THE VIRTUAL PART OF A ONE DIMENSIONAL GREEN FUNCTION. Efremidze, T. I. (Kutais State Pedagogical Inst., Georgian SSR). Soobshch. Akad. Nauk Gruz. SSR, 43: 309-16(Aug. 1966). (In Russian).

It is shown that strict dispersion relations can be written for single-particle Green functions. In addition to the analytical properties an assumption was made on the polynomial limitations in asymptotic behavior of corresponding matrix element. An attempt was made to find the limitations in asymptotic behavior of multiparticle matrix elements imposed by the assumption that unitarity enables the virtual part of the Green function to be expressed as a sum of squares of various matrix elements. For further analysis an asymptotic behavior of many-particle matrix elements ordinarily used in various statistical models was studied using the simplest assumptions. A model of a mass self-interacting scalar field was analyzed. The results were generalized for forward scattering two-particle matrix elements. (R.V.J.)

46406 ORIGIN OF INTERNAL SYMMETRIES. Sudarshan, E. C. G. (Univ. of Rochester, N. Y.). pp 1-13 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

It is considered to what extent a dynamic principle can be expected to generate a symmetry group, and whether the existence of the multiplet structure implies an internal symmetry. It is shown that the idea of charge conservation can be suppressed in both Cutkosky and Sakurai calculations. Also it appears that no particular axion is crucial in the derivation of an internal symmetry since the Sakurai calculation relaxes self-consistency and it is shown that even charge conservation can be relaxed. (J.F.P.)

46407 CONSTRUCTION OF THE INVARIANTS OF THE SIMPLE LIE GROUPS. O'Raifeartaigh, L. (Dublin Inst. for Advanced Studies). pp 15-21 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

The three-dimensional rotational group O_3 is considered. A generalization is made for the polynomial in the infinitesimal generators which satisfy the commutation relations. This polynomial commutes with all the infinitesimal generators and is the only independent polynomial in the infinitesimal generators with this property. All the independent invariants are found. The infinitesimal approach initiated by Casimir is used. Analogies are made with elementary particles and the S-matrix. (J.F.P.)

46408 ON PERATIZATION METHODS. Ranganathan, N. R. (MATSCIENCE, Madras). pp 23-39 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

The recent work of Pais and Feinberg on weak interactions is presented. A technique is developed for summing a class of graphs which yields a finite sum and which differs from the lowest-order calculation by a factor. This formal summation is equivalent to solving a modified integral equation. The question of convergence of any iteration procedure discussed is not considered. Topics discussed include higher-order weak interactions, uncrossed ladder graphs, and the trace equation. (J.F.P.)

46409 MULTIPERIPHERAL MODEL FOR HIGH-ENERGY PROCESSES. Venkatesan, K. (MATSCIENCE, Madras). pp 63-76 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

The multiperipheral model for treating high-energy processes is considered for the behavior of high-energy cross sections for two-particle processes. (J.F.P.)

46410 REGGE POLES IN WEAK INTERACTIONS AND IN FORM FACTORS. Raman, K. (MATSCIENCE, Madras). pp 77-85 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

A summary is given of research on Regge poles in weak interactions, asymptotic behavior of scattering amplitudes and subtractions in form factors, and Regge poles in weak and electromagnetic form factors. (J.F.P.)

46411 SOME APPLICATIONS OF SEPARABLE POTENTIALS IN ELEMENTARY PARTICLE PHYSICS. Mitra, A. N. (Univ. of Delhi). pp 95-101 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

Formal properties found in separable potentials, including such properties as analyticity, double dispersion relations, and Regge behavior of amplitudes constructed from separable interactions are discussed. Also considered is the extension of the concept of separable potentials to the domain of relativistic processes involving elementary particles. (J.F.P.)

46412 MASS CALCULATIONS FOR SOME BARYON AND MESON MULTIPLETS. Kostyrko, I. I. (Inst. of Mathematics, Academy of Sciences, Ukrainian SSR). Yadern. Fiz., 4: 585-6(Sept. 1966). (In Russian).

The case when the f- and A2-resonances belong to a 2^+-nonet is considered. The masses of the other resonances in the 2^+-nonet are calculated under certain assumptions

and a scheme of the calculation of some baryon resonance masses is outlined. (auth)

46413 COMPLEX MOMENTA AND REPRESENTATIONS OF THE POINCARE GROUP. Sannikov, S. S. Yadern. Fiz., 4: 587-96(Sept. 1966). (In Russian).

Unstable states described by complex linear and angular momenta are considered from the point of view of the Poincaré group. Nonunitary representations of the Poincaré group are constructed, corresponding to complex values of the momentum and spin. Representations of the stationary groups are considered as well as representations of the infinitesimal (canonical) Poincaré group operators. The Wigner–Eckart theorem is generalized to the case of arbitrary values of the rotation group representation weights. (auth)

46414 BROKEN SU(6)-SYMMETRY AND ELECTROMAGNETIC PROPERTIES OF BARYONS. Babaev, Z. R.; Zamiralov, V. S. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 597-600(Sept. 1966). (In Russian).

Relations between the magnetic momenta and the amplitudes of magnetic transitions in the SU(6)-symmetry are obtained, taking corrections due to the introduction of moderately strong interactions into account. The obtained formulas are compared with experimental data. (auth)

46415 DECAYS OF MESON RESONANCES IN THE U(6,6) SYMMETRY SCHEME. Volkov, D. V.; Kuraev, E. A.; Tkach, V. I. Yadern. Fiz., 4: 601-2(Sept. 1966). (In Russian).

Using the ladder representation of the U(6,6) group, the relative probabilities were calculated for the decays of higher meson resonances, having the unitary quantum numbers of π- and K-mesons and maximal spin, into vector and pseudoscalar meson octets, assuming the $SU(6)_w$ invariance of the three-particle vertex. A good agreement with the experimental data is obtained for the spin 2^+ resonances A_2^* and K*. (auth)

46416 DISPERSION SUM RULES AND SU(6)-SYMMETRY. Aznauryan, I. G.; Solovev, L. D. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 615-24(Sept. 1966). (In Russian).

Starting from sum rules, following from the usual one-dimensional dispersion relations, the following results are obtained: relations between baryon-pion coupling constants and the widths of the nearest resonances, relations between the magnetic moments of baryons and radiation decay widths of resonances and relations between form factors which together with $SU(6)_w$ give $G_M^{(p)}(k^2)/G_E^{(p)}(k^2) = 3$. The results are compared with experiments and predictions of the SU(6)-symmetry. (auth)

46417 SYMMETRY GROUPS IN CLASSICAL AND QUANTUM MECHANICS. Vinternitz, P.; Smorodinskii, Ya. A.; Uglirzh, M.; Frish, I. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 625-35(Sept. 1966). (In Russian).

All potentials having a dynamical symmetry group in a two-dimensional world are found. Classical and quantum motion in these potentials is investigated and it is shown that in all cases the symmetry group is SU(2). The previously known potentials with higher symmetry (Coulomb potential, harmonic oscillator) are obtained as special cases. (auth)

46418 CONTRIBUTION OF STATISTICAL PROCESSES TO ELASTIC SCATTERING. Sisakyan, I. N.; Chernavskii, D. S. (Lebedev Inst. of Physics, Moscow). Yadern. Fiz., 4: 653-7(Sept. 1966). (In Russian).

The process of statistical scattering to large angles is discussed. The conditions are considered, under which the contribution of this process to elastic scattering is predominant. Elastic diffractional scattering is considered simultaneously and the regions of angles and energies, in which one or the other process dominates, are discussed. Calculations based on the optical model are compared with the experimental data of Cocconi et al. (auth)

46419 RESTRICTIONS ON THE ENERGY DEPENDENCE OF THE S-MATRIX DUE TO THE HERMITICITY OF THE HAMILTONIAN. Baz, A. I. Yadern. Fiz., 4: 658-62(Sept. 1966). (In Russian).

It is shown that derivatives of S-matrix elements with respect to the energy are submitted to certain restrictions. The restrictions have the form of inequalities and their character is quite general, since they follow purely from the hermiticity of the hamiltonian. (auth)

46420 ANGULAR FUNCTIONS WITH COMPLEX MOMENTA. Azimov, Ya. I. (Ioffe Inst. of Physics and Tech., Leningrad). Yadern. Fiz., 4: 663-72(Sept. 1966). (In Russian).

The rotation group matrix elements $d_{\mu\mu'}^{j}(z)$ are used when investigating the partial amplitudes of many-particle processes or processes involving particles with spin. A generalization of the functions $d_{\mu\mu'}^{j}(z)$ to arbitrary values of the argument and indices is considered. Functions of the 2nd type, analogous to the Legendre functions of the 2nd type are also considered. The obtained results are important if complex angular momenta are introduced for many-particle processes. (auth)

46421 SPACE-ISOSPACE MODEL FOR "FUNDAMENTAL" BARYON AND LEPTON FIELDS. Teitler, S. (Naval Research Lab., Washington, D. C.). 43p. (CONF-660633-10). ORAU. Gmelin, AED-CONF-66-199-14.

From American Physical Society, Division of Plasma Physics, Minneapolis, Minn.

A model of baryon and lepton fields is presented which employs the Lorentz algebra, LA, i.e., the Clifford algebra generated using the basis vectors of Lorentz space-time, and its extension, the space-isospace algebra, SIA, generated using the basis vectors of a six-dimensional Euclidean space. This extension from LA to SIA is made in such a way that the 4-component complex spinors in LA become 8-component real spinors in SIA. Special transformations such as time reversal T, space inversion P, charge sign change, baryon charge sign change and the equivalent of complex conjugation are all treated from a unified geometric viewpoint. Isotopic spin and higher unitary symmetry arise naturally in this model and one is led directly to the eight-fold way for baryon fields in a manner which obviates the implied existence of quarks. The structure of lepton fields shows that there are two neutrino-charged lepton pairs of fields that may participate in nucleon leptonic interactions. If only isotopic symmetry is present such an interaction does not couple hyperon and nucleon fields. The observed relatively weak hyperon to nucleon leptonic decay arises only from the occurrence of a mixing of the fields implied by the presence of strong interactions. Finally it is noted that, in principle, there may be hyperon to hyperon weak leptonic decay by means of leptons distinct from those already observed but the chance of observing these new leptons seems negligible. (auth)

46422 ELEMENTARY PARTICLE PHYSICS. Gasiorowicz, Stephen. New York, John Wiley and Sons, Inc., 1966. 628p. $14.95.

A comprehensive survey of elementary particle theory is presented. Quantum field theory, helicity formalism, analyticity, and SU(3) are developed and used for discussions of experiments on decays of resonances, meson (π)-nucleon scattering, peripheral resonance production, electromagnetic form factors, and weak interactions. Included are partially conserved axial vector currents, the Cabibbo theory, and the foundations for the Weisberger sum rule for the axial renormalization constant. Very high energy elastic scattering and the phenomenological interpretation of experiments are also considered. (J.F.P.)

46423 ELEMENTARY PARTICLES. Frazer, William R. Englewood Cliffs, N. J.; Prentice-Hall, Inc., 1966. 197p. $6.95.

Surveys of topics in the field of elementary particles including the eightfold way symmetry scheme of Gell-Mann and Ne'eman, invariance principles and quantum numbers, meson (π)-nucleon scattering, mesons (K), hyperons, resonances observed in final-state interactions, strong-inter-

action dynamics, and weak interactions. Almost the whole work is developed without the use of field theory. (J.F.P.)

46424 SCATTERING THEORY OF WAVES AND PARTICLES. Newton, Roger G. International Series in Pure and Applied Physics. New York, McGraw-Hill Book Company, 1966. 696p. $19.50.

The discussion of scattering theory includes classical electromagnetic theory, classical particle scattering, and quantum mechanical particle scattering. Topics considered are electromagnetic wave scattering formalism, spherically symmetric scatterers, particle scattering in classical mechanics, time-dependent formal scattering theory, cross sections, and formal methods for solution and approximations. Also discussed are single-channel scattering, the Watson-Regge method, elastic scattering of particles with spin, inelastic scattering and reactions, short wavelength approximations, decay of unstable states, and the inverse scattering problem. (J.F.P.)

Fluid Physics and Thermodynamics

See *also* Plasma Physics and Thermonuclear Processes

Refer also to abstract 46325.

46425 (AD–628181) ASYMPTOTIC APPROACH TO HARTMANN-POISEUILLE FLOWS. Final Report, Part 3. Gillis, J.; Brandt, A. (Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Applied Mathematics). Aug. 25, 1965. Contract AF-EOAR-73-63. 28p. (AFOSR–65-2213(Pt.3)). CFSTI $2.60 cy, $0.50 mn.

The steady-state flow is considered with or without the magnetic field. Special attention is given to the rate of approach of the flow to the Hartmann Poiseuille patterns downstream. In general the approach to the limiting pattern is exponential. The exponents are found to fall into two classes, one depending chiefly on the Reynolds number and Hartmann number, and the other on the magnetic Reynolds number and Hartmann number. (auth)

46426 (SC-RR–66-357) A GENERALIZED MAGNETOHYDRODYNAMIC ENTRANCE FLOW MODEL. PART II. SERIES SOLUTION. Saric, W. S.; Touryan, K. J. (Sandia Corp., Albuquerque, N. Mex.). Sept. 1966. Contract AT(29-1)-789. 32p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

The hydromagnetic flow of a conducting, incompressible fluid is analyzed by using the two-conductivity model of Part I of this study. A power series solution is used in solving the problem rather than the momentum-integral method outlined in Part I. (auth)

46427 NONUNIFORM CONDUCTIVITY MHD CHANNEL FLOW SOLUTION BY B. G. GALERKIN METHOD. Eraslan, Arsev H. (Univ. of Tennessee Space Inst., Tullahoma). Contract AF 40(600)-1113. AIAA (Amer. Inst. Aeron. Astronaut.) J., 4: 1759-66(Oct. 1966).

The steady, fully developed MHD channel flow of a viscous, electrically conducting fluid is investigated under applied magnetic and electric fields. The conductivity is assumed to be a function of the space variable across the channel, and the Hall effect is neglected. The application of the B. G. Galerkin method is formulated for the general problem, and numerical results are presented for various conductivity profiles under different loading conditions. It is shown that the variational method has distinct computational advantages over the classical mathematical solutions. The results verify that the flow is strongly affected by the variations in the conductivity, and the assumption of uniformity in the fluid may lead to errors in the analysis of the actual physical problem. (auth)

46428 EFFECTS OF A TRANSVERSE MAGNETIC FIELD AND SPANWISE ELECTRIC FIELD ON THE BOUNDARY LAYER OF A CONDUCTING FLUID. Jaffe, N. A. (Douglas Aircraft Co., Long Beach, Calif.). AIAA (Amer. Inst. Aeron. Astronaut.) J., 4: 1843-6(Oct. 1966).

The effect of an applied electric field in the spanwise direction in addition to a transverse magnetic field on the steady, incompressible, laminar flow of a conducting fluid with constant viscosity over a flat plate is considered. Computed velocity profiles, skin friction coefficients, displacement thicknesses, and momentum thicknesses are shown. The results show a decrease in skin friction accompanied by an unstable velocity profile when a transverse magnetic field is applied; with application of an electric field, the boundary layer becomes thinner and the profiles fuller. Thus it is to be expected that the electric field has a stabilizing effect on the boundary layer and possibilities as a laminar flow control device. (A.G.W.)

46429 ANODE-FALL MEASUREMENTS IN NEON LOW-PRESSURE DISCHARGES. Schaal, G. (Institut fuer Gasentladungsphysik, Greifswald, Ger.). Ann. Physik (7), 17: 329-42(1966). (In German).

Anode-fall measurements in neon low-pressure discharges are described, which were carried out using the Druyvesteyn-modified probe method. The dependence of the anode fall of the anode size and the current strength was investigated, its variation with the occurrence of column oscillations was measured, and the influence of ion motion and ion production was studied. Details on accuracy and reproducibility are considered. A discussion of the measurement definition points up difficulties that must be expected by measurements in nonstationary columns. The results showed that in the homogeneous neon column only positive anode falls occurred, while negative direct-current average values were also established for column oscillations. For small anode sizes the anode-fall values were found to agree with those from the literature. Larger anodes entail a considerable decrease of the fall magnitude. Finally, possible elementary processes are discussed, which could explain the variations of the measurement results. (tr-auth)

46430 INVESTIGATIONS ON THE AMBIPOLAR EFFUSION OF CHARGE CARRIERS FROM THE POSITIVE COLUMN OF A LOW-PRESSURE GLOW DISCHARGE. Hinzpeter, G. (Institut fuer Gasentladungsphysik, Greifswald, Ger.). Ann. Physik (7), 17: 343-55(1966). (In German).

Investigations are reported on the process by Pahl of the ambipolar effusion of charge carriers. The orifice could be placed in a very thin spot of the wall of a straight discharge tube by an improved manufacturing technique such that the required conditions could be fulfilled. The measurements were carried out in neon for 0.5 to 3 torr at discharge currents of 0.1 to 100 mamp and tube radii of 1.5 to 2.5 cm. Application is found to an electronic coupling of the screen potential, which restrains with greater precision the wall potential for the orifice and results appreciably for low frequency oscillations. The dependence of the occurring ion currents on the orifice diameter D is investigated between D = 10 to 100 μm, whereas for $D \leq \lambda$ a constant current density could be observed without additional carry over of charge carriers by the flowing neutral gas. A comparison between measured and different methods of calculated ion currents is undertaken and gives rise to the discussion of the applicability of the method in general. (tr-auth)

46431 THEORY OF HYDRODYNAMIC SELF-EXCITATION OF REGULAR MAGNETIC FIELDS. Tverskoi, B. A. (Moscow State Univ.). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 7-12(1966).

Translated from Geomagn. Aeronomiya, 6: 11-18(1966).

Magnetohydrodynamic phenomena in vortex rings in a conducting fluid are examined. It is shown that such vortexes can substantially intensify the initial field at high magnetic Reynolds numbers and the intensified field partially retains its regular distribution in space and is not orthogonal to the initial field. Therefore, a toroidal vortex can directly regenerate the field. It is shown that self-excitation is possible in a conducting sphere with a pulsating vortex. An analogous phenomenon must take place in a plane convective zone that periodically appears at the boundary between a vacuum and a half-space filled

with a conducting fluid. The possible applications of the given effects are indicated. (auth)

46432 ANALYSIS OF ONE-DIMENSIONAL MGD FLOW IN GENERALIZED ENERGY COORDINATES. Popov, G. A.; Tikhonov, V. B. Magnit. Gidrodin., No. 2, 3-11(1966). (In Russian).

It is shown that the analysis of one-dimensional compressible gas channel flow subjected to arbitrary thermal and mechanical effects is expedient to be carried out in generalized energy coordinates $\Omega-\Pi$, where $\Omega(\sim M)$ is the kinetic energy of the flow to its thermal energy, i.e., its enthalpy ratio, and Π is the mechanical energy to total energy input ratio in the cross section of the duct under consideration. In the particular case of magnetogasdynamics when the losses due to friction and heat transfer between gas and duct walls are neglected, Π is the flow velocity to drift velocity ratio. Taking into account the losses the $\Omega-\Pi$ characteristics for arbitrary polytropic processes are obtained for a duct with constant cross section. Isothermal flows in the space of three parameters: Π, Mach number (M) and duct cross section F are studied. (auth)

46433 SUBSONIC FLOW PAST PROFILES IN MAGNETOGASDYNAMICS. Tkalich, V. S. Magnit. Gidrodin., No. 2, 12-16(1966). (In Russian).

The steady two-coordinate problem of magnetogasdynamics was investigated. The solution was derived in the Chaplygin-Sedov hodograph plane. An effective approximation was constructed. Having used this approximation, the problem of the subsonic flow past profiles was solved. The generalization of Chaplygin's and Prandtl-Glauert's formulas for lift and moment was made. (auth)

46434 APPROXIMATE METHOD FOR DESCRIPTION OF MGD CHANNEL FLOW. Kozyrenko, V. E. Magnit. Gidrodin., No. 2, 17-24(1966). (In Russian).

Investigating the two-dimensional magnetogasdynamic flow, the transformation of hodograph for vortical velocity distribution was made. A method of investigation of magnetogasdynamic flow without the assumptions of quasi-one-dimensional flow theory is considered on the basis of this transformation. (auth)

46435 PROFILING OF LINEAR DUCTS IF THE SLIGHTLY IONIZED GAS IN BRAKED BY TRANSVERSE MAGNETIC FIELD. Bertinov, A. I.; But, D. A. Magnit. Gidrodin., No. 2, 25-31(1966). (In Russian).

The braking of a conducting gas by transverse magnetic field in a diverging rectangular channel confined by two isolating and two conducting walls with variable resistances connected to them is considered. Taking into account the changing of gas conductivity analytical solution for one-dimensional channel flow with constant velocity and arbitrary power to temperature ratio were derived. The obtained solution generalizes the MHD flow with constant Mach number. The optimum load regime is derived from the condition of minimum product of the channel length and the exit cross-section area. (auth)

46436 CONDUCTING GAS FLOW IN AN ANNULAR DUCT IN PRESENCE OF AXIAL MAGNETIC FIELD. Dikii, G. P.; Kostenko, P. P.; Selivanov, V. G.; Frolov, S. D. Magnit. Gidrodin., No. 2, 32-8(1966). (In Russian).

Laminar conducting gas flow in the annular duct of MGD converter in the presence of axial magnetic field is described. Approximate calculations of radial velocity component and gas temperature were carried out. The influence of tangential currents on the converter's electrical efficiency was found. (auth)

46437 MERCURY FLOW IN A CONVEYING TROUGH IN PRESENCE OF TRANSVERSE MAGNETIC FIELD. Vulis, L. A.; Gusika, P. L.; Kusainov, M. K.; Shmelev, Yu. K.; Yaglenko, V. T. Magnit. Gidrodin., No. 2, 61-72 (1966). (In Russian).

A stationary free surface mercury flow in channels with isolated walls and electrodes in the presence of transverse magnetic field was observed. Hydraulic jump in the magnetic field and the influence of field on its location were studied. Experimental data about the continuous flow below and above the critical point are compared with that of the theoretical ones obtained from the one-dimensional approximation. (auth)

46438 MAGNETOHYDRODYNAMIC ROTATION OF CONDUCTING VISCOUS PLASTIC LIQUID IN COAXIAL CHANNEL. Martinson, L. K.; Pavlov, K. B. Magnit. Gidrodin., No. 2, 73-8(1966). (In Russian).

An azimuthal rotation of conducting viscous plastic liquid between two coaxial cylinders in crossed magnetic and electric fields is discussed. The velocity distribution profiles in the presence of axial and radial external magnetic fields are obtained. The determination of sizes of solid rotation zone is reduced to solution of transcendent equation. The existence of transition to Newtonian liquid is shown. (auth)

46439 FLOW OF CONDUCTING LIQUID IN HELICAL PIPES IN PRESENCE OF RADIAL MAGNETIC FIELD. Dikii, G. P. Magnit. Gidrodin., No. 2, 96-100(1966). (In Russian).

Laminar stationary flow of viscous incompressible conducting fluid between two penetrable coaxial cylinders is considered. The azimuthal velocity component on the cylinder surface was assumed to be given. For the induced azimuthal component of magnetic field two conditions must be valid. The azimuthal component is assumed to be given on the surface of the outer cylinder and the condition which follows from the Ohm's law in the load circuit must be observed. Electrical power and electrical efficiency for great values of Reynolds number were computed. (auth)

46440 VISCOUS CONDUCTING FLUID FLOW ENTRY PROBLEM IN RECTANGULAR DIVERGENT CHANNEL. Simuni, L. M. Magnit. Gidrodin., No. 2, 101-4(1966). (In Russian).

Equations for laminar two-dimensional flow of viscous conducting fluid in the entry of a rectangular divergent channel were solved numerically. The influence of magnetic Reynolds numbers was estimated. (auth)

46441 INFLUENCE OF RELATIVE ROUGHNESS ON MAGNETOHYDRODYNAMIC FLOW. Dukure, R. K. Magnit. Gidrodin., No. 2, 109-15(1966). (In Russian).

The behavior of the transition friction coefficient of the conducting fluid flow in the presence of a transverse magnetic field is investigated. The influence of relative roughness on the transition friction coefficient was studied. Criteria for determination of the transition friction factor in rough pipes in the presence of transverse magnetic field are proposed. The regions for magnetohydrodynamic flow in rough pipes are defined. The influence of relative roughness on the boundaries between various regions is discussed. (auth)

46442 EFFECT OF CROSSED ELECTRIC AND MAGNETIC FIELD ON THE PSEUDO-FLUIDIZATION PROCESS OF SOLID PARTICLES IN CONDUCTING FLUID. Andres, U. C.; Linkova, S. A. Magnit. Gidrodin., No. 2, 148-52(1966). (In Russian).

The fluidization process of nonconducting particles by means of an electrolyte in the presence of crossed electric and magnetic fields is investigated. In the investigated interval Lorents force does not influence the fluidization process qualitatively but influences the quantitative parameters of the process remarkably. Using the analogy between the fluidization and sedimentation process the coefficient of electromagnetic pressing out force is evaluated and its dependence of the porosity is found. The increasing of concentration of solid particles gives rise to the increasing of Lorents force coefficient. (auth)

46443 MAGNETOHYDRODYNAMIC CHANNEL FLOWS WITH NONEQUILIBRIUM IONIZATION. Sherman, Arthur (General Electric Space Sciences Lab., Valley Forge, Pa.). Phys. Fluids, 9: 1782-7(Sept. 1966).

The behavior of a magnetohydrodynamic channel, with finite segmented electrodes, when a plasma in a nonequilibrium state and with tensor conductivity flows through

it with constant (uniform) velocity is presented. The non-equilibrium effect is taken into account by assuming the plasma electrical conductivity to be a linear function of the current density. The problem, which is highly non-linear, is solved by expanding in powers of the proportionality constant to obtain a recursive set of linear equations. Only the zeroth- and first-order solutions are presented. They are obtained numerically. For the cases studied, no shorting due to leakage between adjacent electrodes exists. Despite this inclusion of the non-equilibrium effect causes a reduction of the Hall (axial) electric field. (auth)

46444 ATTENUATION IN SHOCK TUBES. Slepicka, F. (Inst. of Thermomechanics, Prague). Phys. Fluids, 9: 1865-6(Sept. 1966).

A simple theoretical derivation is given of the empirical formula of Emrich and Wheeler which enables one to calculate the shock wave attenuation due to boundary layer effect from the initial pressure conditions in a shock tube. (auth)

46445 TURBULENT MAGNETOHYDRODYNAMIC CHANNEL FLOW. Tennekes, H. (Pennsylvania State Univ., University Park). Phys. Fluids, 9: 1876-9(Sept. 1966).

An analogy appears to exist between turbulent magneto-hydrodynamic channel flow at high Reynolds numbers and moderate Hartmann numbers on one hand, and turbulent boundary-layer flow with suction on the other. Skin-friction calculations confirm the existence of the analogy. (auth)

46446 PROBLEM IN MAGNETOHYDRODYNAMICS. Sharikadze, Dzh. V. (Tbilisi State Univ., Georgian SSR). Soobshch. Akad. Nauk Gruz. SSR, 43: 295-300(Aug. 1966). (In Russian).

A mathematical analysis is made of a nonstationary, viscous, incompressible, conducting fluid flow in the presence of an external magnetic field with porous wall permeability depending only on time. (R.V.J.)

46447 APPROXIMATE SOLUTION OF CERTAIN BOUNDARY LAYER PROBLEMS CONSIDERING MAGNETIC FIELD. Sharikadze, D. V. (Tbilisi State Univ., Georgian SSR). Soobshch. Akad. Nauk Gruz. SSR, 43: 551-4(Sept. 1966). (In Russian).

Problems of the stationary boundary layer of viscous, incompressible, conducting fluid flow in the presence of a magnetic field were resolved by combining the boundary layer method with the method of successive approximations. (R.V.J.)

46448 STABILITY OF A FLEXIBLE CURRENT-CARRYING CONDUCTOR IN A LONGITUDINAL MAGNETIC FIELD. Nikulin, M. G. Zh. Tekh. Fiz., 36: 1149-51(June 1966). (In Russian).

The criterion derived by M. A. Leontovick and V. D. Shafranov for the stability of a flexible cylindrical current-carrying conductor in a longitudinal magnetic field with respect to smooth sinuous displacements whose amplitudes are small compared with the radius of the conductor is shown to be valid also for the case of smooth sinuous displacements of arbitrary amplitude. The scalar potential was employed, rather than the vector potential, to describe the magnetic field. The stability condition is derived for distortion of the conductor into an elliptic helix whose tangent makes a small angle with a line parallel to the axis but whose semi-major and semi-minor axes may be arbitrarily large. (ATD)

46449 MAGNETOGASDYNAMIC ELECTRIC GENERATOR. Crown, John Conrad; Pinsley, Edward A. (to United Aircraft Corp.). U. S. Patent 3,268,746. Aug. 23, 1966. Filed Dec. 29, 1960.

A magnetogasdynamic generator of the type wherein the working fluid is ionized substantially only in the region of electrical generation is described. A primary object of the invention is to provide a generator in which the short-circuit losses are minimized or completely avoided. An essentially nonionized fluid is introduced to the generating region and is ionized by some seeding material. The degree of ionization and hence the electrical conductivity of the working fluid is substantially reduced by the introduction of a quenching fluid in the vicinity of the end of the generating region. (W.D.M.)

Geophysics

46450 (AD-628255) DYNAMICS AND STRUCTURE OF THE OUTER RADIATION BELT. Fan, C. Y.; Meyer, P.; Simpson, J. A. (Enrico Fermi Inst. for Nuclear Studies, Univ. of Chicago, Ill.). 1961. Contracts AF18(600)-666; NASw-2. 102p. (AFOSR-1133; EFINS-61-34). CFSTI $10.60 cy, $0.75 mn.

From an analysis of electron measurements in the Explorer VI satellite (August 7-October 6, 1959) four time-dependent parameters were investigated which characterize the outer electron belt. They are: (1) the equatorial electron intensity, (2) the equatorial range from the earth of the peak intensity, (3) the electron density distribution along a line of force through the intensity peak, and (4) a measure of the change in electron spectrum with time. These parameters along with measurements of magnetic field intensity make it possible to study the origin of the changes in electron intensity and distribution which are known to occur in the outer belt. (TAB)

46451 (AD-628761) BALLOON-BORNE MEASUREMENTS OF SOLAR IONIZING RADIATION. Final Report, July 1, 1962-June 30, 1965. Riedler, Willi (Kungliga Vetenskapsakademien, Kiruna (Sweden). Geofysiska Observatoriet). Oct. 31, 1965. Contract AF61(052)-604. 265p. (AFCRL-66-34). CFSTI $26.10 cy, $1.50 mn.

A total number of 127 balloon flights is described, performed in the period July 1962 to June 1965 in the northern auroral zone. Instruments used were GM-tube single counters and telescopes, ionization chambers and scintillation counters. The recorded data are presented in graphical form. Some scientific results are shortly discussed. The work has been performed as a cooperation program between Kiruna Geophysical Observatory, Kiruna, Sweden, Max-Planck-Institut fur Aeronamie, Lindau, Germany, and Laboratoire de Physique Cosmique, Meudon, France. (auth)

46452 (AD-630094) THE IONOSPHERE BELOW 100 KM (D-REGION): A SIMPLE MODEL. Arnold, H. R.; Pierce, E. T. (Stanford Research Inst., Menlo Park, Calif.). Sept. 1963. Contract DA-36-039-sc-87197. 55p. (RM-11). CFSTI $5.60 cy, $0.50 mn.

The parameters involved in the formation of the D region of the ionosphere are discussed in detail in an attempt to deduce the most reasonable values for them given with the present knowledge of the ionosphere at heights of 40-100 km. The ionization due to solar radiation and from other sources, chiefly cosmic radiation, is also discussed and a model that includes the effect of solar cycle variations is derived. Several calculations, using the suggested values for the parameters, are made, including a comparison to an experimental profile for which the agreement is found to be remarkably good. Finally, mention is made of possible stratification due to winds and turbulence at D-region heights. (auth)

46453 (AD-630126) DETERMINATION OF THE ELECTRON DENSITY IN THE IONOSPHERE BY THE PULSE DELAY TECHNIQUE. Final Report, February 2, 1962-March 31, 1965. Baker, Kay D.; Allred, Glen D. (Utah Univ., Salt Lake City. Upper Air Research Lab.). Mar. 1966. Contract AF19(628)-352. 132p. (AFCRL-66-55). CFSTI $13.60 cy, $1.00 mn.

Rocketborne pulse-delay and pulse-phase experiments were developed to measure integrated free electron density between a rocket operating in the ionosphere and stations on the earth's surface. Electron density is related to the group delay and phase velocity of transmitted signals, and is attained by measuring these parameters. The transit time and phase velocity of probing signals near the critical frequency of the layer of ionosphere under investigation, are compared with those of a refer-

ence signal which suffers negligible effects during transit. Three rockets were instrumentated with upward transmission pulse delay experiments and launched, and a fourth, instrumented with a downward pulse-phase delay experiment, was brought to a state of near readiness. A miniature rocketborne system has resulted which is capable of yielding parameters related to electron density. While of limited value in a highly disturbed ionosphere, the experiment is a valuable source of data in an undisturbed medium. (auth)

46454 (AD-630182) DETERMINATION OF SOLAR PROTON ENERGY SPECTRUMS BELOW 100 Mev FROM GROUND-BASED MEASUREMENTS. Adams, G. W.; Masley, A. J. (Douglas Aircraft Co., Inc., Santa Monica, Calif. Missile and Space Systems Div.). Feb. 1966. 20p. (SM-51974). CFSTI $1.00 cy, $0.50 mn.

A technique is presented for calculating solar proton energy spectrums from electron density profiles measured during solar cosmic-ray events. The electron density profile is converted to an electron-ion pair production rate profile, and the spectrum determined by using the proton range-energy relations. This technique is applied to seven electron density profiles determined with multifrequency riometers in the July 1961 solar cosmic-ray events, and the resulting spectrums are compared to satellite measurements. Coupling this method of calculation with the multifrequency riometer technique for determining electron density profiles gives a means of determining solar proton energy spectrums entirely from ground-based measurements. (auth)

46455 (AD-630183) COMMENTS ON SOLAR ALPHA-PARTICLE CONTRIBUTIONS TO RIOMETER MEASUREMENTS. Space Physics and Planetary Sciences. Adams, G. W.; Masley, A. J. (Douglas Aircraft Co., Inc., Santa Monica, Calif. Missile and Space Systems Div.). Feb. 1966. 14p. (SM-51997). CFSTI $1.00 cy, $0.50 mn.

In a recent publication, Weir and Brown (J. Geophys. Res., 69 (11), 2193-2198, 1964) calculated the effects of solar protons and α particles on riometers and concluded that, in cases where the alpha-proton ratio is close to unity, the particles are responsible for more than 75% of the ionospheric absorption, and that solar particle event might be a more appropriate expression than solar proton event. The purpose of this comment is to point out that their conclusions are the result of their choice of geomagnetic cutoff, that this cutoff is unrealistic from the standpoint of normal riometer work, and that solar alpha-particle dominance is rarely, if ever, observed. (auth)

46456 (NP-16319) ENERGETIC PARTICLES IN THE EARTH'S MAGNETIC FIELD. Anderson, Kinsey A. (California Univ., Berkeley). Mar. 1966. 102p.

Theoretical and experimental investigations of the Earth's radiation zones are discussed. Information is given on sources of geomagnetically trapped charged particles. Discussions are also included on the Earth's magnetic field, motion of trapped particles, precipitation of particles into the atmosphere, particle distribution and lifetimes, and temporal features of auroral zone particle precipitation. (J.H.M.)

46457 (SC-RR-66-280) IONOSPHERIC PROPAGATION OF VERY SHORT HF PULSES. Stuetzer, O. M. (Sandia Corp., Albuquerque, N. Mex.). Aug. 1966. Contract AT(29-1)-789. 23p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The ionospheric propagation of microsecond-duration pulse trains to distances of several thousand kilometers is investigated theoretically. It is limited by dispersion. The parabolic model is used to approximate the properties of the ionosphere. A rectangular high frequency pulse of N sinusoids is assumed as the transmitted signal. The integral transform describing the shape of the received signal is established and is numerically evaluated, for F-layer propagation and a distance of 3000 km, by machine computation. We find that shape and amplitude of the received signal depend strongly on the critical frequency of the ionosphere. Effective bandwidths of the order of 1 MHz are obtained by proper carrier frequency choice. Ionospheric propagation appears, therefore, to be usable for transmission of a very short h-f pulse. (auth)

46458 BEHAVIOR OF RADIATION BELTS AND ANOMALOUS COSMIC RADIO NOISE ABSORPTION IN THE AURORAL ZONE DURING THE MAGNETIC STORMS OF FEBRUARY 12-14 AND 20-21, 1964. Vernov, S. N.; Driatskii, V. M.; Kuznetsov, S. N.; Logachev, Y. I.; Sosnovets, E. N.; Stolpovskii, V. G. (Moscow State Univ.). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 1-6(1966).

Translated from Geomagn. Aeronomiya, 6: 3-10(1966).

The behavior of the outer radiation belt and anomalous absorption of cosmic radio noise in the auroral zone during the magnetic storms of February 12-14 and 20-21, 1964, are investigated. The behavior of the outer radiation belt and the anomalous absorption of cosmic radio noise are compared with various phases of magnetic storms. (auth)

46459 COSMIC-RAY TRAJECTORIES IN A GEOMAGNETIC FIELD, REPRESENTED WITH A HIGH DEGREE OF ACCURACY. Dorman, L. I.; Medvedev, M. Yu.; Smirnov, V. S. (Polar Geophysical Inst., Kola Branch, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 13-18(1966).

Translated from Geomagn. Aeronomiya, 6: 19-26(1966).

The influence of the higher harmonics of the geomagnetic field on cosmic-ray trajectories is investigated. It is shown that the accuracy of modern geomagnetic field charts makes it possible to determine the asymptotic directions of cosmic rays in the region of low energies with an accuracy of up to 2°. The acceptance cones of various stations are discussed. The results of computations of asymptotic directions are presented for the Soviet network of stations. (auth)

46460 ROCKET DATA ON THE BEHAVIOR OF ELECTRON CONCENTRATION IN THE IONOSPHERE AT HEIGHTS OF 100 TO 300 KM. II. Kazachevskaya, T. V.; Ivanov-Kholodnyi, G. S. Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 19-25(1966).

Translated from Geomagn. Aeronomiya, 6: 27-36(1966).

The behavior of the ionosphere during the nighttime and variations in the heights of the E and F regions are examined on the basis of rocket measurements of electron concentration. After sunset the decrease of n_e at heights of 125-160 km is characterized by an effective recombination coefficient $\alpha' = (0.35 - 1) \cdot 10^{-7}$ cm^3 sec^{-1} in agreement with the daytime value of α'. In the nighttime E-layer, at heights of 110-120 km, n_e decreases considerably more slowly with $\alpha' \leq 10^{-8}$ cm^3 sec^{-1}. It is assumed that the nighttime E-layer is sustained by a corpuscular ionization source which slowly weakens after sunset and whose power decreases tens and hundreds of times during low solar activity. The height of the base of the E region decreases with increasing geomagnetic activity and depends on the season: it is smaller in winter and summer than in spring and autumn. The height of the F region decreases during the daytime and at night during low solar activity and depends on the season: it is greater in summer and autumn than in winter and spring. At night hF is greater than during the daytime. There is a sunrise-sunset effect: a sharp increase in the height hF after sunrise and prior to sunset. (auth)

46461 STUDY OF THE SCATTER OF THE NORMAL DIURNAL VARIATION OF CRITICAL F2 LAYER FREQUENCIES (IONOSPHERE). Singler, A. (Heinrich Hertz Inst., Academy of Sciences, German Democratic Republic). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 26-9(1966).

Translated from Geomagn. Aeronomiya, 6: 37-42(1966).

Knowledge of irregular fluctuations in the diurnal variation of F2 layer ionization is important for forecasting the propagation of short radio waves. The limit of these fluctuations can be computed as a function of season and of the phase of the solar cycle by expanding in a series the individual diurnal f_0 F2 variations. The results show a poorly defined annual variation and a quadratic dependence on the relative sunspot number. (auth)

46462 THE F1 LAYER DURING A PERIOD OF DECREASING SOLAR ACTIVITY. Shchepkin, L. A. (Inst. of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 30-3(1966).

Translated from Geomagn. Aeronomiya, 6: 43-8(1966).

The latitudinal distribution is examined of values characterizing the average diurnal probability of observation of the F1 layer and the relative number of observations of a fully developed layer, of the cosines of the zenith angle of the sun corresponding to the beginning of reliable observation of the layer in its seasonal and diurnal development, and of the coefficients of asymmetry of the diurnal variation of the frequency of observation of the layer. The latitudinal variations and the magnitudes of the parameters in question are compared with analogous data for a period of high solar activity. (auth)

46463 CHARACTERISTICS OF THE SPORADIC E LAYER AS A FUNCTION OF THE TECHNICAL PARAMETERS OF AN IONOSPHERIC STATION. Chasovitin, Yu. K. (Rostov-on-the-Don State Univ., USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 34-8(1966).

Translated from Geomagn. Aeronomiya, 6: 49-55(1966).

The data of the Rostov ionospheric station from September 1961 to June 1962 are used to examine the characteristics of the E_s layer as a function of the technical parameters of the station. It is shown that for all types of E_s the dependence of cutoff frequencies and screening frequency on receiver sensitivity and transmitter power is weak, as a rule, even for considerable changes of these equipment parameters. It is assumed that in most cases an acceptable model for middle-latitude types of E_s is a thin layer with a most probable thickness of ~500–1000 m at the level of half the maximum electron concentration. (auth)

46464 ORIENTATION OF AN IONOSPHERIC STATION ANTENNA AND RELATIVE INTENSITY OF MAGNETOIONIC COMPONENTS. Rapoport, Z. Ts. (Polar Geophysical Inst., Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 39-44(1966).

Translated from Geomagn. Aeronomiya, 6: 56-62(1966).

The relative intensity of magnetoionic components is analyzed as a function of the orientation of an ionospheric station antenna on the basis of derivations of the magnetoionic theory. The influence of antenna orientation on the intensity of the ordinary component used (or being transmitted) is also examined. The analysis is made with allowance for the influence of electron collisions with heavy particles on the orientation and eccentricity of the ellipses of the limiting polarization of magnetoionic components. (auth)

46465 RADIO WAVE PROPAGATION IN AN IONIZED CLOUD ARTIFICIALLY PRODUCED IN THE EARTH'S INHOMOGENEOUS ATMOSPHERE. Mar'in, N. P. Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 45-8(1966).

Translated from Geomagn. Aeronomiya, 6: 63-7(1966).

The method of geometric optics is used to find ray trajectories in an ionized cloud formed at a great height in the inhomogeneous atmosphere of the earth as a result of the diffusion of particles capable of ionizing the air. (auth)

46466 SHORT RADIO WAVE PROPAGATION CONDITIONS IN THE ANTARCTIC. Driatskii, V. M. Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 49-57(1966).

Translated from Geomagn. Aeronomiya, 6: 68-79(1966).

The influence of various types of polar absorption on radio wave propagation conditions in the Antarctic is examined. The reliability of radio communications for paths of different orientation and length is computed, using the measured field intensities of the radio station at Mirny Observatory. The significant difference between the role of polar cap absorption and auroral zone absorption is indicated. Ideas are expressed concerning the computation of the relative radiated power necessary to provide normal radio communications conditions on specific paths with a given radio wave absorption. (auth)

46467 FREQUENCY DEPENDENCE OF IONOSPHERIC ABSORPTION AT HIGH LATITUDES. Khodzha-Akhmedov, Ch. L. Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 58-62(1966).

Translated from Geomagn. Aeronomiya, 6: 80-6(1966).

From an analysis of experimental data on ionospheric absorption at high-latitude stations, it is shown that in most cases auroral zone absorption is inversely proportional to the nth power of frequency, where n = 1.5 to 1.7. The equivalent heights of the absorbing regions are at the 50- to 70-km level and upward. The conclusion is reached that with high absorption values the results of riometer measurements on two frequencies can apparently be used to extrapolate absorption to low frequencies. For polar cap absorption the exponent varies from 1 to 2 and the equivalent absorption heights, from 46 to 80 km. (auth)

46468 COMPUTATIONS OF LOW-FREQUENCY ELECTROMAGNETIC WAVE PROPAGATION IN THE EARTH-IONOSPHERE WAVEGUIDE. Guseva, E. G.; Fligel, D. S. (Inst. of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 71-6 (1966).

Translated from Geomagn. Aeronomiya, 6: 97-104 (1966).

The results of computations of the amplitude and phase velocity of low-frequency electromagnetic waves in the range 1 to 30 kHz in the vicinity of the earth's surface for a plane and spherical earth-ionosphere waveguide are compared with experimental data. The limits of applicability of a plane waveguide model are examined and the necessity for systematic allowance for the influence of the geomagnetic field at frequencies below 10 kHz is emphasized. (auth)

46469 SOLAR COSMIC RAYS OF SEPTEMBER 21 AND 26, 1963. Charakhch'yan, A. N.; Kvashnin, A. N.; Charakhch'yan, T. N. (Lebedev Inst. of Physics, Moscow. Moscow State Univ.). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 93-5(1966).

Translated from Geomagn. Aeronomiya, 6: 126-8(1966).

Solar cosmic rays, generated during the chromospheric flare of class 3^+ on September 20 and the flare of class 3^+ on September 26, were recorded on September 21 and 26, 1963, in the stratosphere at Olen'ya, Murmansk region, and at the same time at Mirny. The results of measurements on September 21, 1963 are plotted. It can be seen from the plotted curves that the results of simultaneous measurements over Olen'ya and Mirny practically coincide, which agrees with the ideas concerning the isotropic distribution of solar cosmic rays in space near the earth. Also included are the results of: measurements of the September 26 flare, obtained with a single counter; the conversion of mean free path data to energy for protons; and measurements for the September 26 flare and previous flares that show the time dependences of the number of primary protons. (J.H.M.)

46470 FLUCTUATIONS OF THE ISOTHERMAL MAGNETOSPHERE OF THE EARTH. Nikolaev, Yu. M. (Moscow State Univ.). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 95-8(1966).

Translated from Geomagn. Aeronomiya, 6: 129-31 (1966).

When acoustic waves propagate in a medium of variable density their velocity increases as density decreases. In the presence of a magnetic field and of high conductivity the acceleration may continue to higher velocities, since in this case the equations are similar to gas-dynamic equations and the characteristic length, determining the limits of applicability of hydrodynamics, is the Larmor radius of ions, but only in the case when magnetic pressure in undisturbed regions varies according to the same law as density (Vedenov, A. A., and Sagdeyev, R. Z., transactions of the VI Conference on Problems of Cosmogony, Izd, AN SSSR, 1959). If magnetic pressure decreases more slowly, the presence of the field may interfere with acceleration, because Alfvén velocity increases as pressure decreases and, consequently, the rate of energy removal, i.e., the cause of acceleration, disappears (Tverskoi, B. A., Dokl. Akad. Nauk SSSR, 1962, 144, No. 2). The case of an isothermal atmosphere in a homogeneous gravity field is examined by magnetohydrodynamic equations. (J.H.M.)

46471 PLASMA CONCENTRATION AT GREAT HEIGHTS ACCORDING TO DATA ON TOROIDAL FLUCTUATIONS OF THE MAGNETOSPHERE. Gul'el'mi, A. V. (Inst. of Terrestrial Physics, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 98-101 (1966).

Translated from Geomagn. Aeronomiya, 6: 132-4(1966).

The spectrum of toroidal magnetosphere fluctuations depends on the distribution of plasma concentration in space and on magnetic field intensity. Equatorial profiles of plasma concentration according to the latitudinal dependence of the period of the fundamental mode of toroidal fluctuations have been constructed previously by other authors. A priori assumptions were made concerning the shape of the profile (power-law, exponential, etc.). It is unlikely in a plasma-exosphere out of equilibrium at distances of tens of thousands of kilometers that a simple law of concentration decrease persists. Therefore, previous profiles found should be regarded as effective, but not real. Calculations are presented for obtaining equatorial profiles of plasma concentration without any prior assumptions regarding their shape. (auth)

46472 PITCH ANGLE DISTRIBUTION OF AURORAL PROTONS. Vaisberg, O. L. (Inst. of Atmospheric Physics, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 101-3(1966).

Translated from Geomagn. Aeronomiya, 6: 135-7(1966).

Previous studies indicate that one must reject the assumption that the angular and energy distributions of auroral protons are independent. Even if protons do not experience noticeable scattering during deceleration in the atmosphere there is no reason to believe that the angular distribution of injected protons is independent of their energy. Equations are given for obtaining the angular characteristics of the distribution of protons absorbed in the atmosphere. Directional intensity as a function of angle is shown for three energy values ($1 - E \leq 1$, $2 - E = 3$, and $3 - E = 20$ kev). Considering the fact that an injected proton will be decelerated in the atmosphere to zero velocity and that the proportion of protons escaping the atmosphere is small, the differential energy spectrum of injected protons is illustrated. A comparison of results indicates that low-energy protons experience strong scattering in the atmosphere. (J.H.M.)

46473 DETERMINATION OF THE DENSITY OF IONOSPHERIC PLASMA BY THE PHASE METHOD. Dnestrovskii, Yu. N.; Kostomarov, D. P. (Moscow State Univ.). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 104-5 (1966).

Translated from Geomagn. Aeronomiya, 6: 138-9(1966).

A method that can be used for ionospheric sounding, based on measurements in a definite frequency band of the phase difference of waves that are incident upon a plasma and are reflected from it, is described. (J.H.M.)

46474 RELATIONSHIP BETWEEN MAGNETIC ACTIVITY AND DISTURBANCES IN THE F_2 LAYER OF THE IONOSPHERE. Nikol'skii, A. P. Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 106-7(1966).

Translated from Geomagn. Aeronomiya, 6: 140-1(1966).

The existence of "forbidden" periods in a day for the beginning of ionospheric disturbances in the F2 layer is discussed. A comparison is made of results of analysis of observations of magnetic disturbances from ionospheric stations located at various longitudes. Diurnal distribution of the frequency of appearance of magnetic disturbance peaks for various stations is plotted. (J.H.M.)

46475 STATISTICAL DISTRIBUTION OF Δf_0F_2. Goncharova, E. E.; Kuleshova, V. P. (Inst. of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 107-9(1966).

Translated from Geomagn. Aeronomiya, 6: 142-3(1966).

An analysis is given of the statistical distribution of Δf_0F_2 according to data from ionospheric stations located at middle latitudes, in the auroral zone, and in the polar cap. Examples are shown of the statistical distribution of Δf_0F_2 for various stations for years of maximum and minimum solar activity. (J.H.M.)

46476 STABILITY OF REFLECTIONS FROM THE SPORADIC E LAYER AND SOLAR ACTIVITY. Chavdarov, S. S.; Chernysheva, S. P.; Shatkhin, Kh. Z. (Rostov-on-the-Don State Univ., USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 109-11(1966).

Translated from Geomagn. Aeronomiya, 6: 143-5(1966).

Ionospheric data are analyzed from Rostov-on-the-Don for 1960–1964, covering together with the 1958–1959 data, half of a solar cycle, to obtain information on the relationship between the sporadic E layer and solar activity. Information is included on diurnal and seasonal variations of the appearance of sporadic E layers. (J.H.M.)

46477 IONOSPHERIC EFFECTS OF THE SUDDEN COMMENCEMENT OF THE MAGNETIC STORM OF JULY 15, 1959. Shashun'kina, V. M. (Inst. of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 111-14(1966).

Translated from Geomagn. Aeronomiya, 6: 146-8(1966).

An investigation is made of the ionospheric effect of the sudden commencement (SC) of a magnetic storm of July 1959 on a global scale. Analysis was performed on critical frequencies, f_0, and rises in virtual heights, h', of the F2 layer. Curves are shown for the time variation of f_0F2 and $h'F2$ after the SC for stations located in the order of decreasing latitudes, and information is included on the propagation of the ionospheric disturbances after the SC. (J.H.M.)

46478 MEASUREMENT OF ABSORPTION IN THE IONOSPHERE BY THE A5 METHOD. EQUIPMENT. FIRST RESULTS. Zelenkova, I. A.; Zelenkova, V. E.; Zaitsev, V. P. (Ionospheric Section, Academy of Sciences, Kazakh SSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 114-15(1966).

Translated from Geomagn. Aeronomiya, 6: 149-50(1966).

Results are given of measurements of radiowave absorption in the ionosphere by the A5 method (same as the A1 method, vertical sounding at fixed frequencies, but with a continuously variable frequency). The measurements were made by a standard swept ionospheric vertical sounding station. (J.H.M.)

46479 LONG-DISTANCE PROPAGATION OF ULTRASHORT RADIO WAVES AS A RESULT OF SCATTERING IN THE IONOSPHERE IN THE SUBPOLAR ZONE, AND THE STATE OF THE IONOSPHERE. Kolobova, A. P.; Rapoport, Z. Ts. (Polar Geophysics Inst., Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 116-18(1966).

Translated from Geomagn. Aeronomiya, 6: 151-2(1966).

Experiments on the long-distance propagation of ultrashort radio waves by scattering in the ionosphere, which were conducted on the Leningrad-Murmansk link in 1962, are discussed. The variations of hourly signal levels at a frequency of 38.1 MHz and f_{min} at Rugozero for October 26, 1962, are plotted. Data of October 28–29, 1962, are presented that include the variation of signal level, f_{min}, and fE_s. The data indicate that inhomogeneity increases as ionization, or the ionization gradient, increases. The intensity of an ultrashort wave signal increases with increasing absorption and fE_s. (J.H.M.)

46480 CURRENTS PRODUCING MAGNETIC DISTURBANCES AT MIDDLE LATITUDES. Mishin, V. M. (Inst. of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 121-3(1966).

Translated from Geomagn. Aeronomiya, 6: 157-8(1966).

Magnetic disturbances at middle latitudes are ordinarily regarded as the results of ionospheric currents that penetrate into these latitudes from the auroral electrojet (Chapman, S. and Bartels, J., Geomagnetism, Oxford, 1951 and Ben'kova, N. P., Electric Current System of Magnetic Storms, Tr. NIIZM, 1953, No. 10). Other ideas advanced by Mishin, Platonov, Chapman, and Akasofu suggest that a large proportion of middle-latitude currents is of local

origin. Facts are presented to substantiate the idea of local origin of currents. (J.H.M.)

46481 ALLOWANCE FOR MAGNETIC FIELD VARIATIONS ACCOMPANYING AURORAS DURING RADAR INVESTIGATIONS OF THE STRUCTURE OF AURORAL IONIZATION. Pogorelov, V. I. (Inst. of Atmospheric Physics, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 123-6(1966).

Translated from Geomagn. Aeronomiya, 6: 159-61 (1966).

Information is presented on the correlations of auroral ionization, scattering, and geomagnetic field fluctuations with the reflection of radar from a point in space. The distribution of distances and azimuths of reflection zones for radar equipment located at 60.2°N and 29.6°E and operating at 72 MHz is shown. Experiments and computations indicate that space distribution of reflection zones cannot be used to compute the dimensions of inhomogeneities of auroral ionization if consideration is not given to the distribution of the terrestrial field during magnetic storms and magnetic disturbances will introduce an error that will be greater the wider the radiation pattern of the antenna. (J.H.M.)

46482 TIME VARIATION OF THE VECTOR OF PREFERRED PP POLARIZATION ACCORDING TO OBSERVATIONS AT LOVOZERO. Lyatskii, V. B.; Selivanov, V. P. (Leningrad Zhdanov State Univ.). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 126-7(1966).

Translated from Geomagn. Aeronomiya, 6: 162-3(1966).

Lovozero Observatory recorded the variations of the vertical component of the magnetic field from June 9 to Oct. 4, 1964. The data obtained during this period were used to analyze the behavior of the vector of preferred orientation of pearl-type pulsations, PP. Investigations were conducted for PP necklaces (a sequence of equidistant PP outbursts, whose intensity increases uniformly toward the middle of the necklace and then decreases smoothly), continuous series, and brief PP outbursts. It was found that the pearls appear simultaneously in earth currents and in the geomagnetic field and that their forms are the same in the first approximation for all cases of activity. (J.H.M.)

46483 INFLUENCE OF LOCAL GEOELECTRIC CONDITIONS ON THE SUDDEN COMMENCEMENT OF MAGNETIC STORMS. Van'yan, L. L.; Marderfel'd, B. E. (Complex Scientific Research Inst. of Sakhalin, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 128-9(1966).

Translated from Geomagn. Aeronomiya, 6: 163-4(1966).

It is noted that the vertical component of the magnetic field is closely associated with the geoelectric characteristics of the upper shells of the earth, whereas the horizontal component is practically independent of them. Analysis of the sudden commencements of magnetic storms were made to verify this theoretical position. For analysis 25 sudden commencements recorded by the Yuzhno-Sakhalinsk magnetic observatory and by five Japanese observatories were selected. The vertical and horizontal components are tabulated for a number of sudden commencements. Data indicate that the most pronounced geoelectric inhomogeneity is at the seashore. The currents that are induced in the sea and are intensified as a result of skin effect in the vicinity of the coast produce on land noticeable vertical component variations, having practically no effect on the horizontal component. (J.H.M.)

46484 SOME PATTERNS OF GEOMAGNETIC BAYS AT SAKHALIN. Van'yan, L. L.; Marderfel'd, B. E. (Complex Scientific Research Inst. of Sakhalin, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 129-30(1966).

Translated from Geomagn. Aeronomiya, 6: 165(1966).

The results of magnetic field variations recorded at Sakhalin, 1964, are analyzed. Analysis of the observations of the vertical component of geomagnetic bays of a duration of 1–3 hours shows that the form of the record varies insignificantly for a distance between the observation points of up to 800 km. Data indicate that the amplitude of the vertical component of the magnetic field decreases to the south and varies approximately in an inverse proportion to the cube of the distance to the auroral zone. (J.H.M.)

46485 TWO TYPES OF PARTICLE INJECTIONS INTO THE POLAR ZONE. Pudovkin, M. I.; Smirnov, N. S. (Polar Geophysical Inst., Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 131-2 (1966).

Translated from Geomagn. Aeronomiya, 6: 166-8(1966).

Investigations have revealed a difference in the relationship between positive and negative magnetic disturbances and riometer absorption (Oguti, Rept. Ionosphere Space Res. Japan, 17, No. 4, 291, 1963). Two types were distinguished among positive (daytime) magnetic disturbances, which differ not only in outer appearance, but also in physical properties. The nature of these two types of disturbances is investigated in relation to simultaneous disturbances on the night side of the earth by tracing the development of a specific disturbance on the magnetograms of several observations located along the auroral zone. The data suggest that the particle exciting a magnetic disturbance moves at a definite rate along the auroral zone. Results indicate that there are two types of particle injections into the earth's magnetosphere: (1) injections embracing simultaneously the entire auroral zone and (2) injections occurring directly only on the night side. (J.H.M.)

46486 CYCLIC GEOMAGNETIC VARIATIONS AND THEIR USE IN THE COMPUTATION OF THE ELECTRIC CONDUCTIVITY OF THE EARTH. Kulieva, R. N. (Inst. of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, Academy of Sciences, USSR). Geomagn. Aeronomy (USSR) (Engl. Transl.), 6: 133-6(1966).

Translated from Geomagn. Aeronomiya, 6: 169-71 (1966).

Determining cyclic geomagnetic variations by the method of "11-year moving averages" is discussed. The analysis is based on data from various magnetic observatories together with information concerning the years for which the data are used. The field of cyclic variations is divided into an external and an internal part. Values are tabulated of the ratio of the amplitudes of the external and internal fields, the phase difference of the external and internal fields, electric conductivity, the radius of the conducting core, and the thickness of the conducting layer. Methods of using geomagnetic variations for computing electric conductivity of the earth are discussed and the results are included. (J.H.M.)

46487 SUDDEN ELECTROMAGNETIC FIELD VARIATIONS AS AN INDICATOR OF THE STATE OF THE RADIATION BELTS AND THE MAGNETOSPHERE OF THE EARTH. Troitskaya, V. A.; Bol'shakova, O. V.; Matveeva, E. T. (Inst. of Physics of the Earth, Academy of Sciences, SSSR). Geomagn. Aeronomiya, 6: 533-40(1966). (In Russian).

Changes in the position of the boundary between the magnetosphere and the external radiation belts, brought about by excited stable oscillations and intensity changes in the belts as a function of excited irregular short-period oscillations, are investigated. The measurements were made by Electron-1, Electron-2, and Explorer-XII satellites. The data show that: (1) the boundary between the magnetosphere and the radiation belts fluctuates about its mean position $\sim 10R_e$, where R_e is the radius of the earth; (2) Geomagnetic field oscillations of Pc4 type (50–150 sec) are observed when the boundary is located at a distance of $10R_e$ or more; (3) geomagnetic field oscillations of Pc2 and Pc3 types (5-40 sec) appear when the boundary moves toward the earth; (4) the extremum values of the boundary positions vary from 7.5 R_e to 12.5 R_e; (5) periods of stable oscillations (T) are proportional to R^5, where R is a radius of the magnetosphere; (6) the existence of stable oscillations (Pc) in the main storm phase may indicate that the compression of the magnetosphere continues during this phase; (7) intensity changes in the radiation belts are closely connected with the introduction of charged particles into the

upper atmospheric layers; and (8) the presence of irregular short-period oscillations of "pearl" type (Pcl) is connected with sharp intensity changes in the radiation belts. (ATD)

46488 OBSERVATIONS OF A DIFFUSE WAVE OF RELATIVISTIC ELECTRONS IN THE OUTER RADIATION BELT. Vernov, S. N.; Savenko, I. A.; Tel'tsov, M. V.; Shavrin, P. I. (Moscow State Univ.). Geomagn. Aeronomiya, 6: 661-3(1966). (In Russian).

The generation of relativistic electrons in the outer radiation belt can be attributed to the transfer of charged particles across the drift shells. The propagation of diffuse waves of relativistic electrons, first recorded by Explorer XIV, was also recorded by Kosmos 41 when it passed the outer radiation belt. At the high geomagnetic latitudes, the propagation of the diffuse wave may be distorted by changes in the pitch-angle distribution. However, in the present case, the diffuse wave exhibited characteristics peculiar to the dynamics of a diffusion wave of hard electrons. The intensity of relativistic electrons decreased somewhat at the beginning of geomagnetic perturbation. It increased at distant L shells (>5) of the magnetosphere several days after geomagnetic perturbation. Further shift of the intensity maximum toward the region of smaller L occurred in the absence of geomagnetic disturbances. This was followed by a decrease in intensity and a shift in the intensity maximum to its initial position. During the magnetic storm on 1 September 1964, recorded by Kosmos 41, the intensity of electron flux with energies greater than 2 Mev at L = 5 was $3.5 \times 10^2/cm^2sec$. A peak of hard electrons with an intensity of $10^3/cm^2sec$ was recorded on September 3–4 at L = 6–7. This peak was shifted to smaller L shells until it reached a maximum intensity of $10^4/cm^2sec$. Variations in the protonosphere were of smaller amplitude. The diffuse wave of relativistic electrons was thus first observed in the outer radiation belt at high geomagnetic latitudes. This wave was not accompanied by low-energy protons. (ATD)

46489 MECHANISM OF INFLUENCE OF SOLAR ACTIVITY ON THE ATMOSPHERE AND LITHOSPHERE OF THE EARTH. Sytinskii, A. D. Geomagn. Aeronomiya, 6: 726-32(1966). (In Russian).

It is shown that the planetary atmospheric processes are the link connecting earth seismicity with solar activity. Increases in solar corpuscular radiation increase the potential energy of the atmosphere and decrease its kinetic energy. As a result of these changes, normal atmospheric motion, established by the temperature gradients in the troposphere, is disrupted. This, in turn, causes a redistribution of the atmospheric mass around the globe and a consequent disturbance of the figure of the earth. The angular moment of the atmosphere remains unchanged in the process. It is concluded that the mean capacity of internal energy sources is 1–2 orders of magnitude smaller than the mean capacity due to solar activity. Examples of strong earthquakes are explained by peculiarities of atmospheric pressure variation causing significant disruptions in the equilibrium of the figure of the earth. Energy computations are presented to support these contentions. (ATD)

46490 IONOSPHERIC GRAVITY WAVES CAUSED BY NUCLEAR EXPLOSIONS. Oksman, Juhani (Geophysical Observatory, Sodankyla, Finland); Kivinen, Matti. Geophysica (Helsinki), 9: 119-29(1965).

Ionospheric observations made at Nurmijärvi and Sodankylä (Finland) following the Russian nuclear test at Novaya Zemlya on September 19, 1962, are reported. Four consecutive waves were observed in the F region on the ionosphere, causing descending cusps in the h'(f) recordings. These waves are interpreted as being internal gravity waves propagating in the altitude range of the F region. The wave fronts are tilted, having leading higher ends. The mean velocities of different waves ranged from 640 to 150 m/sec, the mean wave length above Nurmijärvi being about 750 km. A model is presented for the effect of a wave with the assumed properties on an ionosphere with one layer. The isoionic surfaces are denoted by means of curves, some closed, others open. The closed curves surround dense clouds of ionization. The length of the wave was calculated from a mean speed of 300 m/sec and a period of 42 min. All ionograms obtained could be explained by this general model which is discussed, but some minor modifications were necessary. For instance, the inclusion of the F_1 layer into the picture allows many cusps to be observed simultaneously. It seems now well established that the ionospheric disturbances observed after nuclear explosions in the atmosphere are caused by internal gravity waves generated by the explosions. The waves are similar to but stronger than the ionospheric gravity waves often observed under normal conditions. The waves seem to travel in the F region and cause concentrations and rarefactions in the electron density. If the shape of the isoionic surfaces is chosen properly, the variation of the ionograms with time can be explained. The observed period of the waves (~40 min) seems to increase with increasing distance from the site of explosion. Three to four consecutive waves are generated by each explosion. (BBB)

46491 PROTON-INDUCED HYDROXYL FORMATION ON THE LUNAR SURFACE. Zeller, E. J. (Brookhaven National Lab., Upton, N. Y.); Ronca, L. B.; Levy, P. W. Contract AT(11-1)-1057. J. Geophys. Res., 71: 4855-60 (Oct. 15, 1966). (BNL-10395).

The interaction of both the particle and photon component of the solar wind with the lunar surface material is expected to produce diverse chemical reactions. Experimental evidence for proton-induced OH formation was obtained by bombarding a glass, chemically similar in composition to common silicate minerals, with high-energy protons. The concentration of OH, before and after irradiation, was determined by infrared absorption measurements. The OH formation rate was greatest at the start of the bombardment and decreased with increasing dose. The maximum proton to OH conversion rate, at the start of the irradiation, is at least 5 or 10% and may be as high as 100%. Using this result, together with estimates of the lunar age and recent solar proton flux data, it was able to make very rough calculations of the minimum proton-induced OH content in the lunar surface. If mixing or churning is not important, the upper centimeter could contain 4×10^{16} OH per cm^3. When protons below 40 Mev and the higher conversion rate are included in the computation, the estimated OH concentrations could increase by a factor of 10 or more. If surface mixing or churning has occurred, they should be divided by an average churning depth. (auth)

46492 EARTH'S RADIATION BELTS. White, R. Stephen (Aerospace Corp., Los Angeles). Phys. Today, 19: No. 10, 25-9; 32-8(Oct. 1966).

A second large radiation zone was discovered by a Geiger counter on the moon probe Pioneer 3. These belts, previously displayed in a review by Van Allen, are reproduced and discussed. The shapes of the inner and outer electron belts, in three dimensions, are sketched with the three types of charged-particle motion superimposed. Information is included on the proton and electron drifts around the earth. Composite and radius-latitude flux maps for electrons with energies greater than 0.5 Mev and for protons with energies greater than 4, 15, 34, and 50 Mev are shown. (J.H.M.)

46493 A UNIFIED TREATMENT OF MAGNETOSPHERIC DYNAMICS WITH APPLICATIONS TO MAGNETIC STORMS. Siscoe, G. L. (California Inst. of Tech., Pasadena). Planet. Space Sci., 14: 947-67(Oct. 1966).

The Chapman-Ferraro boundary current, the tail current, and the ring current are considered with regard to the role they play in transferring the force of the solar wind to the Earth through their interaction with the geomagnetic field. The results obtained in the case of Chapman-Ferraro current and ring current agree with previous calculations. The force acting between the tail and the Earth during nonstorm conditions is shown to be between $\frac{1}{5}$ and $\frac{1}{10}$ the force

balanced by the Chapman-Ferraro current. Such a force is shown to result from a tangential Maxwell stress if the normal component of the field to the boundary is of the order of 0.01 γ. The results of this approach are applied to magnetic storm observations. A relation between the magnitude of a sudden commencement or sudden impulse and the associated change in the solar wind pressure is obtained, and is shown to agree with observations made by Mariner 2. The observed local time asymmetry of the main phase magnetic storm field of certain large magnetic storms is interpreted as a field gradient produced by a much intensified solar wind pressure, the largest observed asymmetry requiring a 150-fold increase in pressure over the pre-storm value. (auth)

46494 THE DEVELOPMENT OF THE FORBUSH DECREASE AND THE GEOMAGNETIC STORM FIELDS. Yoshida, S.; Akasofu, S.-I. (Univ. of Alaska, College). Planet. Space Sci., 14: 979-86(Oct. 1966).

Relationships between the development of Forbush decreases and characteristics of associated geomagnetic storm fields are examined. It is shown that the onset of a significant Forbush decrease is more closely related to the development of successive sudden impulses or world-wide geomagnetic micropulsations during geomagnetic storms than to a simple step function-like storm sudden commencement. The magnitude of the main phase decrease shows no obvious relation with the magnitude of the Forbush decrease, as discovered first by Forbush. (auth)

46495 ELECTRIC FIELD HEATING OF D-REGION ELECTRONS. Walker, James C. G. (Queen's Univ., Belfast). Planet. Space Sci., 14: 987-90(Oct. 1966).

It is shown that electric fields cannot heat electrons in the lower ionosphere to temperatures significantly above the gas temperature. For altitudes below about 85 km the argument is based directly on measured values of the characteristic energy of electrons in nitrogen. For altitudes above about 85 km the argument is based on the inhibiting effect of the geomagnetic field. Because electric currents are effectively continuous, most of the heating results from electron motion perpendicular to the magnetic field, which is inhibited by the Lorentz force. An electric field greater than 3.5×10^{-4} V cm^{-1} is needed to raise the electron temperature significantly, even at high altitudes. It would take a neutral wind of at least 700 m sec^{-1} to produce such a field by induction. (auth)

46496 VARIATION OF AURORAL RADIO ABSORPTION WITH GEOMAGNETIC ACTIVITY. Hargreaves, J. K. (Inst. for Telecommunication Sciences and Aeronomy, Boulder, Colo.). Planet. Space Sci., 14: 991-1006 (Oct. 1966).

The intensity of the ionospheric radio adsorption observed at several sites in the auroral regions is related to the magnetic activity, indicated by the planetary index K_p. As the degree of magnetic disturbances increases, the absorption zone intensifies, broadens, and moves equatorward. By combining these observations with other recent results it is possible to estimate how the energy dissipated by the precipitation of energetic electrons into the atmosphere during auroral disturbances varies with the velocity of the solar wind. (auth)

46497 MEASUREMENTS OF ANTENNA IMPEDANCE IN THE IONOSPHERE. II. OBSERVING FREQUENCY GREATER THAN THE ELECTRON GYRO FREQUENCY. Stone, R. G.; Alexander, J. K.; Weber, R. R. (Goddard Space Flight Center, Greenbelt, Md.). Planet. Space Sci., 14: 1007-16(Oct. 1966).

The results of measurements of the impedance of a short dipole antenna in the ionosphere at observing frequencies above the electron gyro frequency but near the electron plasma frequency are reported. The reactive component of impedance is found to change from capacitive at the hybrid resonance frequency, $X = 1 - Y^2$, as predicted by theory. The real component of impedance becomes orders of magnitude larger than the free space radiation resistance in the region bounded by the hybrid frequency, $X = 1 - Y^2$, and the plasma frequency, $X = 1$, in qualitative agreement with theory. For $X > 1$, however, the resistance remains larger than predicted theoretically. Although the large peaks in resistance are accompanied by large enhancements in the apparent radio noise level, it is still not clear what portion of the measured resistance is due to electromagnetic radiation. Other mechanisms such as losses via electrostatic waves may help to account for the difference between the experimental data and simple theory. (auth)

46498 PLASMA OF THE EXOSPHERE. Lucke, O. (Humboldt-Univ., Berlin). Z. Meteorol., 17: 109-20 (1963). (In German).

The plasma structure of interplanetary space, the theory of magnetic storms, and the theory of magnetic field pulsations are discussed. Alfvén's theory and experiments suggested by it are discussed. The penetration of and flowing past a local concentrated magnetic field by a plasma cloud are discussed from the Chapman-Ferraro theory and the hypothesis of the solar wind. Models for coronal activity are outlined, as well as their activity on the earth's surface. A discussion of magnetic storms and the electric ring currents of the earth follows, with several discrepancies between theory and observation being noted. Two theories of geomagnetic pulsations are outlined: the resonance theory and the hypothesis of oscillating electron packets, with deficiencies noted for the latter case. A number of illustrations to support certain hypotheses are given. (BBB)

Gravitation, Quantum Mechanics, and Relativity Theory

46499 (AD-629763) RESEARCH ON ELEMENTARY PARTICLES AND RELATIVITY THEORY. Final Technical Report, 1962-1965. Arnowitt, Richard (Northeastern Univ., Boston, Mass.). Dec. 1965. Contract AF33(657)-10161. 158p. (ARL-65-254). CFSTI $5.00 cy, $1.00 mn.

Topics in classical and quantum relativity theory discussed are: examination of asymptotic properties of general relativity in the space-like asymptotic region, critique of the Hoyle-Narlikar theory, analysis of q-number coordinate transformations, study of a quantized spinor field in an external gravitational field, study of the role of rigid bodies in relativity, and analysis of scattering of a gravitational wave off a mass point. (auth)

46500 (INR-687/VII/PH) THE PROBLEM OF DYNAMICAL GROUPS IN QUANTUM MECHANICS. Szymacha, A.; Werle, J. (Warsaw Univ. (Poland). Institute of Nuclear Research, Warsaw (Poland)). Feb. 1966. 9p. Dep.

The restrictions imposed by the existence of a dynamical group of the Hamiltonian $H = (p^2/2) + V(r)$ are investigated. It is shown that the potentials $V = -(c/r)$ or $V = ar^2$ necessarily follow from the respective dynamical groups O_4 or SU_3 without the use of the additional assumptions made by other authors. (auth)

46501 PERTURBATION THEORY OF BOUND STATES. Hausmann, K. (Technische Univ., Dresden). Ann. Physik (7), 17: 368-73(1966). (In German).

It is shown for a particle in the one-dimensional binding potential that the perturbation theory starting from a free particle leads to divergences. The divergences are analyzed, physically interpreted, and eliminated for potentials of limited range. The result is a simple perturbation method for the energies of bound ground states. (tr-auth)

46502 ELEMENTARY PROCESSES OF QUANTUM MECHANICS IN STOCHASTIC VIEWS. Bopp, Fritz (Institut fuer Theoretische Physik, Munich). Ann. Physik (7), 17: 407-14(1966). (In German).

The simple formulation of the description of production and annihilation of point particles leads to a stochastic equation, which is equivalent to the corresponding quantum mechanical equation. Since all equations of nonrelativistic quantum mechanics are combinations of such elementary processes, quantum mechanics is given directly from the

representation of the elementary processes "production-annihilation" just as the Newtonian mechanics from the representation of the elementary processes "infinitesimal motion." (tr-auth)

46503 REPORT ON QUANTUM THEORY OF OPTICAL COHERENCE. Paul, H. (Deutsche Akademie der Wissenschaften, Berlin). Fortschr. Phys., 14: 141-204(1966). (In German).

The transition from the classical description of the electromagnetic radiation field to the quantum electrodynamic radiation field is sketched. The temporal alteration of a free electromagnetic field is considered within the framework of the Heisenberg picture. The physical properties of the maximum coherent (quantum mechanical) state of the electromagnetic field are derived. The question of the alteration of the coherent behavior of the radiation through the process of absorption and induced emission and a transfer of the coherent properties of the incident beam to newly produced light beams after interaction with matter are discussed. The significance of the maximum coherent state for the accurate formulation of corresponding transition from the quantum electrodynamic to the classical electrodynamic is represented, and its significance for the quantum electrodynamical description of a laser beam is investigated. (J.S.R.)

46504 SOLVABLE VECTOR AND SCALAR POTENTIALS FOR THE DIRAC EQUATION. Stanciu, G. N. (Los Alamos Scientific Lab., N. Mex.). Phys. Lett., 23: 232-3 (Oct. 17, 1966).

The Dirac equation is exactly solved for four different configurations of the external electromagnetic fields. These previously unknown solutions of the Dirac equation are written in terms of known solutions of the Schroedinger equation. (auth)

46505 TEMPERATURE CUTOFF IN QUANTUM FIELD THEORY AND MASS RENORMALIZATION. Misra, S. P. (Regional Engineering Coll., Rourkela, India). pp 125-34 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

In quantum field theory, one often needs a cutoff, particularly when considering the mass differences of highly symmetric multiplets, in which case one cannot dispose of infinite constants simply by calling them unobservable effects. There is such a cutoff in statistical mechanics, universal for an assembly of particles at fixed temperature and independent of the nature of the individual particles. An analogous quantum mechanical temperature cutoff is discussed. (M.O.W.)

46506 THEORY OF A GENERAL QUANTUM SYSTEM INTERACTING WITH A LINEAR DISSIPATION SYSTEM. Vasudevan, R. (MATSCIENCE, Madras). pp 209-28 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

The formalism developed by Feynman and Vernon is sketched using Feynman's space-time formulation of nonrelativistic quantum mechanics. It is shown that in certain cases the effect of external systems can be included in a class of functionals (influence functionals) of the coordinates of the system itself. (M.O.W.)

46507 ENERGY DENSITY OF STATIC GRAVITATIONAL FIELD AND SOME PROPERTIES OF NORDSTROEM AND SCHWARZSCHILD METRICS. Fomin, P. I. Ukr. Fiz. Zh., 11: 946-9(1966). (In Ukrainian).

The example of Nordström and Schwarzschild metrics shows that the energy-momentum pseudotensor, in the form given by Møller, provides a reasonable description of the energy density in the case of static gravitational fields and some local properties of these spaces are considered, applying the concept of energy density. (auth)

46508 A GENERALIZED DIRAC EQUATION. Tribble, David B.; Delaney, Robert M. (St. Louis Univ.). 12p. (CONF-660411-56). ORAU. Gmelin, AED-CONF-66-060-131.

From American Physical Society Meeting, Washington, D. C.

A 1st order differential field equation (covariant under transformations of the theory of general relativity) was constructed via a mathematical formalism called cotensor and cospinor analysis. This equation was shown to be a generalized Dirac equation, reducing to the Van der Waerden spinor equations for constant metric. Analysis of the equation and its solutions as a c-number theory was carried out. The equation exhibits the correct invariance under P, C, and T transformations and the theory contains the required spin content. Whereas the Dirac solutions are 4-fold degenerate in energy, the present solutions are 16-fold degenerate. For flat space, the solutions decompose into a direct product of two bispinors, one of which is the ordinary Dirac solution. Investigation of the other bispinor as a possible "charge" bispinor has been initiated, and some evidence to justify this description has been obtained. (auth)

Low Temperature Physics

46509 (COO-1569-1) EXPERIMENTAL AND THEORETICAL STUDIES IN SOLID STATE AND LOW TEMPERATURE PHYSICS. Annual Progress Report for 1966. Goldman, A. M.; Nosanow, L. H.; Zimmermann, W.; Weyhmann, W. (Minnesota Univ., Minneapolis. School of Physics). Sept. 1966. Contract AT(11-1)-1569. 29p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Various experimental and theoretical investigations in superconductivity, theory of quantum crystals, mixtures of helium isotopes, magnetism in metals, superfluidity in liquid helium, and millidegree refrigeration facility are described. (W.D.M.)

46510 (NASA-TN-D-3638) PRELIMINARY OBSERVATIONS OF THE ENHANCEMENT OF SUPERCONDUCTING CURRENT-CARRYING CAPACITY IN NIOBIUM THROUGH HYDROGEN TREATMENT. Smith, Robert J.; Hegland, Donald E.; Kendziorski, Patricia R. (National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center). Sept. 1966. 10p. CFSTI $1.00 cy, $0.50 mn.

Measurements of resistivity as a function of applied magnetic field at constant current and temperature and resistivity as a function of temperature at constant current and field were obtained for niobium below 20°K. The measurements were taken after annealing niobium at 1600°C and again after treating the annealed niobium with hydrogen in a 0.1 N sulfuric acid solution. The results show that the current-carrying capacity of the hydrogen-treated niobium is greater than four times that of annealed niobium. (auth)

46511 CONTRIBUTION TO THE STUDY OF EXCITATIONS IN SUPERCONDUCTORS. Caroli, Christiane (Univ., Paris, Orsay, France). Ann. Inst. Henri Poincare, Sect. A, 4: 159-261(Apr. 1-May 15, 1966). (In French).

The excitation spectrum of a superconductor is studied for three different situations of space-varying order parameter: (1) When a pure type II superconductor is in the Schubnikov state, its spectrum contains localized states with energy much smaller than the gap in zero field. These low-lying excitations have an important effect on the low-temperature properties of the metal (specific heat, nuclear relaxation, etc.). (2) In the metastable state of superheating, a pure type I superconductor contains low energy excitations loaclized in the vicinity of the surface. The corresponding density of states can be measured by a tunneling experiment. (3) A nonmagnetic impurity induces space variations of the order parameter of a superconducting solvent. This perturbation is correlated with a modification of the transition temperature of a dirty superconducting alloy. (auth)

46512 INTERACTION OF NiAl WITH NIOBIUM. Kornilov, I. I.; Mints, R. S.; Guseva, L. N.; Malkov, Yu. S. Izv. Akad. Nauk SSSR, Metal., No. 6, 132-6(Nov.-Dec. 1965). (In Russian).

The phase diagram of the system NiAl-Nb was investi-

gated. The microhardness and microstructure of the various phases and the superconductivity of the compounds NbNiAl and Nb_2NiAl were determined. The experimental results are summarized in graphs and tables. It was found that the Nb–Ni–Al system forms two intermetallic compounds, viz: NbNiAl and Nb_2NiAl. The compound Nb_2NiAl becomes superconductive at 4.2°K, but the compound NbNiAl does not become superconductive at the temperatures investigated, i.e., down to 1.4°K. (ATD)

46513 STRUCTURE OF SUPERCONDUCTIVE VORTICES NEAR A METAL–AIR INTERFACE. Pearl, Judea (RCA Labs., Princeton, N. J.). J. Appl. Phys., 37: 4139-41(Oct. 1966).

The current distribution along a vortex line emerging from a bulk superconductor is computed. The current density at the metal–air interface was found to follow a $1/r^2$ law at far distances from the vortex axis, while deep inside the metal it falls off exponentially. The effect of this structure on the macroscopic behavior of superconductors is discussed. (auth)

46514 A METHOD OF CRITICAL MAGNETIC-FIELD MEASUREMENT FOR HIGH-FIELD SUPERCONDUCTORS IN PULSED MAGNETIC FIELDS. Suenaga, M.; Ralls, K. M. (Univ. of California, Berkeley). Contract W-7405-eng-48. J. Appl. Phys., 37: 4197-4200(Oct. 1966). (UCRL–16822).

A high magnetic-field magnetization technique was devised, which allows rapid measurement of superconducting to normal transition fields (H^*_{c2}) for bulk high-field superconductors in pulsed magnetic fields up to 200 kG. Values of H^*_{c2} so obtained are in good agreement with those obtained by resistive techniques. A complete magnetization curve is obtained in the same time that one point could be determined for a resistive critical current density vs field curve. The significance of such a dynamic magnetization curve is discussed. (auth)

46515 ELASTIC MODULI OF THE LEAD–THALLIUM ALLOYS. Alers, G. A.; Karbon, J. A. (Ford Motor Co., Dearborn, Mich.). J. Appl. Phys., 37: 4252-5(Oct. 1966).

The adiabatic elastic moduli of single crystals of lead containing 1 to 17% thallium were measured using the ultrasonic pulse echo technique. Data at room temperature, 77 and 4.2°K were obtained. It was observed that increasing the thallium content decreased all the moduli in spite of the fact that the interatomic distance decreases with thallium additions. Values of the Debye θ_0 parameter were calculated from the 4.2°K modulus values. (auth)

46516 CRITICAL FIELDS OF TYPE II SUPERCONDUCTORS IN THE PRESENCE OF ELECTRON SPIN EFFECTS. Saint-James, D. (Centre d'Etudes Nucleaires de Saclay, Gif-sur-Yvette, France). Phys. Lett., 23: 177-8(Oct. 17, 1966).

The field H_{c3} in the presence of spin paramagnetism at all temperatures in the dirty case has been calculated, and it is shown that the simultaneous measurement of H_{c3} and H_{c2} yields a direct determination of the parameter $\alpha = \sqrt{2}H_{c2}(0)/H_p(0)$. (auth)

46517 ANGULAR DEPENDENCE OF THE PINNING AND THE FLOW OF VORTICES IN THIN SUPERCONDUCTING FILMS. Deltour, R.; Tinkham, M. (Univ. of California, Berkeley). Phys. Lett., 23: 183-4(Oct. 17, 1966).

The pinning force and the flow regime of vortices in thin superconducting films are shown to depend essentially on the perpendicular component of the magnetic field with respect to the plane of the films. (auth)

46518 GEOMETRICAL RESONANCE EFFECT IN SUPERCONDUCTING TIN. Tomasch, W. J. (Atomics International, Canoga Park, Calif.). Contract AT(11-1)-Gen-8. Phys. Lett., 23: 204-6(Oct. 17, 1966).

Geometrical resonances were observed in the tunneling characteristics of Sn films 2.4 to 4.3 μ thick. Results are interpreted in terms of quasiparticle standing waves. Crystallite texture, multiplegap behavior, and a new aspect of the overlay effect are also described. (auth)

46519 50 c/s a-c LOSSES IN Nb–Cu COMPOSITE CONDUCTORS AT 4.2 DEG K. Slaughter, R. J.; Rogers, E. C.; Grigsby, R. (British Insulated Callender's Cables Ltd., London). Phys. Lett., 23: 214-15(Oct. 17, 1966).

Composite conductors were prepared by backing niobium strip with copper strip. Calorimetric measurements of 50 c/s a-c losses in the superconducting niobium in liquid helium at 4.2°K show that the presence of the copper can substantially reduce the losses. (auth)

46520 EXPERIMENTAL VERIFICATION OF THE MAGNETIC DEPENDENCE OF THE ORDER PARAMETER OF SUPERCONDUCTORS. Alphonse, G. A. (RCA Labs., Princeton, N. J.); Bergstein, L. Phys. Lett., 23: 221-3 (Oct. 17, 1966).

The order parameter was obtained for superconductors in arbitrary tangential magnetic fields. A transmission line technique is devised to measure the order parameter; the experiments performed on tin confirm the predictions from the theory. (auth)

46521 ANOMALOUS SPECIFIC HEAT OF Nb_3Sn IN THE LIQUID HELIUM REGION. Vieland, L. J.; Wicklund, A. W. (RCA Labs., Princeton, N. J.). Contract AF33(615)-3936. Phys. Lett., 23: 223-4(Oct. 17, 1966).

The specific heat of Nb_3Sn was found to contain a linear term over the range of reduced temperatures $16 < T_c/T > 3.6$, amounting to about 4% of the normal state electronic specific heat. (auth)

46522 ON THE $2\Delta p/n$ STRUCTURE OF Pb–PbO–Pb TUNNEL JUNCTIONS. Zawadowski, A. (Central Research Inst. for Physics, Budapest). Phys. Lett., 23: 225-6(Oct. 17, 1966).

The fine-structure of the tunneling characteristics observed in Pb–PbO–Pb superconducting tunnel junctions was interpreted as $2\Delta p/n$ structure due to the breaking of p electron pairs and the tunneling of n electrons in the same processes. (auth)

46523 STABILITY OF SUPERFLUID FLOW IN AN ANNULUS. Donnelly, R. J. (Univ. of Chicago); Fetter, Alexander L. Contract AF 49(638)-1389. Phys. Rev. Lett., 17: 747-50(Oct. 3, 1966).

The flow of superfluid in an annulus is considered on the basis of free-energy arguments. Two critical velocities appear: One is equivalent to comparing the free energy of the fluid with the free energy of solid-body rotation; the other is equivalent to making the free energy of the fluid zero and corresponds to Feynman's criterion. (auth)

46524 LOW-TEMPERATURE SPECIFIC HEATS OF UNANNEALED NIOBIUM WIRES IN MAGNETIC FIELDS. Ferreira da Silva, J.; Van Duykeren, N. W. J.; Dokoupil, Z. (Kamerlingh Onnes Laboratorium, Leiden). Physica, 32: 1253-73(July 1966).

Specific heats of unannealed niobium in the form of a bundle of thin wires with a κ-value of 2.37 were measured at various longitudinal magnetic fields thus covering the three regions in the phase diagram of this type-II superconductor. The results are compared with a few approximate formulae and theoretical predictions. At the lower temperatures the predicted term in the specific heat proportional to T and roughly proportional to H was observed in the mixed state. The specific heat behaves in accordance with an approximate formula first proposed by Gorter. The jump in the specific heat when passing into the normal state is roughly proportional to T^3 but smaller than predicted by Maki for very short mean free paths of the electrons. The temperature dependence of H_{c2} on T has the character predicted by Maki but is somewhat steeper. (auth)

46525 SUPERCONDUCTIVITY IN THIN NONDEGENERATE SEMICONDUCTING FILMS. Kogan, V. G.; Tavger, B. A. (Lobachevskii State Univ., Gorkii, USSR). Soviet Phys.-Solid State (Engl. Transl.), 8: 808-11(Oct. 1966).

Translated from Fiz. Tverd. Tela, 8: 1008-12(Apr. 1966).

The phenomenon of superconductivity in a thin semiconducting film, when the electron states lie in a two-dimensional Brillouin zone, is examined. The dependence of the appearance of superconductivity upon film thickness, carrier concentration, and depth of the impurity levels is investigated for the nondegenerate case. It is found that the region of superconductivity is bounded not only by an upper temperature, but also by a lower, nonzero temperature. (auth)

46526 ELECTRODYNAMICS OF SUPERCONDUCTORS. Zumino, B. (New York Univ., New York). pp 117-23 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

London's theory and the Landau-Ginzburg theory are briefly described in terms of persistent currents, Meissner effect, and flux quantization in superconductors. (M.O.W.)

46527 INTRODUCTION TO QUANTUM STATISTICS OF DEGENERATE BOSE SYSTEMS. Mohling, Franz (Univ. of Colorado, Boulder). pp 149-58 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

Brief descriptions are given for the following: free Bose gas, Bose-Einstein condensation, degenerate Bose system with interactions, and quantum-statistical theory of the degenerate Bose system. (M.O.W.)

46528 ABOUT ASYMPTOTIC EXACT CALCULATION OF FREE ENERGY FOR MODEL SYSTEM WITH THEORY OF SUPERCONDUCTIVITY. Bogolyubov, N. N. Vestn. Moskov. Univ., Ser. III, Fiz. Astron., No. 1, 94-104(Jan.-Feb. 1966). (In Russian).

An asymptotic precise solution for a Bardeen type model is developed. A new mathematical method was constructed in order to show that, in the theory of superconductivity, the magnitudes of free energies per unit of volume computed by means of the model and approximate hamiltonians differ very little in their asymptotics. The data obtained hold good for $\Theta \geq 0$. (tr-auth)

46529 QUANTIZED SUPERFLUID VORTICES. Fetter, A. L. 12p. (CONF-660633-4). ORAU. Gmelin, AED-CONF-66-199-10.

From American Physical Society, Division of Plasma Physics, Minneapolis, Minn.

One of the most striking features of condensed superfluids is the formation of vortices, which have been observed both in liquid helium II and in superconductors. The most obvious common property of these superfluids is their frictionless flow, in which an initial state of motion persists indefinitely. An attempt is made to relate the behavior of the vortices in the two different substances and to show how a single unified description can be given. (W.D.M.)

46530 SUPERCONDUCTORS AND SUPERFLUIDS. Bardeen, John (Univ. of Illinois, Urbana). 48p. (CONF-660633-2). ORAU. Gmelin, AED-CONF-66-199-6.

From American Physical Society, Division of Plasma Physics, Minneapolis, Minn.

Some experiments related to the macroscopic quantum aspects of superfluids are reviewed. Superfluid flow can be described by a condensate wave function with amplitude and phase. While a correct description of a superconductor is nonlocal, requiring a pair wave function, a good qualitative and even semi-quantitative picture can be obtained from a local model. It is shown how superfluid properties are related to the macroscopic occupation of a quantum state, from Bose condensation in He II and from pairing in superconductors. The momentum state of macroscopic occupation is related to the gradient of phase of the condensate wave function. The phase may be regarded as a quantum field variable conjugate to particle number. The Hamiltonian is the total free energy of the system and the equations of motion are the continuity equation and the equation giving acceleration of the superfluid. Applications of the theory to experiments on quantization of circulation and of flux, on various phenomena involving Josephson tunneling and on vortex motion in type II superconductors illustrate some of the aspects of macroscopic quantization that were observed. (auth)

46531 ADVANCES IN CRYOGENIC ENGINEERING. VOLUME 11. Proceedings of the 1965 Cryogenic Engineering Conference, Rice University, Houston, Texas, Aug. 23–25, 1965. Timmerhaus, K. D. (ed.). Advances Cryog. Eng., 11: 1-712(1966). (CONF-650802).

Separate abstracts were prepared for 19 of the 76 papers. Seven of the remaining papers were previously abstracted and these may be found under CONF-650802 in the report number index. The remaining papers were not in scope, hence were omitted. (W.D.M.)

For abstracts of individual papers see: 46532–46550.

46532 HELIUM REFRIGERATOR AND LIQUEFIER. Collins, S. C. (Massachusetts Inst. of Tech., Cambridge. Arthur D. Little, Inc., Cambridge, Mass.). Advances Cryog. Eng., 11: 11-15(1966).

A helium-hydrogen refrigerator constructed at M.I.T. in 1949 is described. In March 1964, plans were made to construct a new helium liquefier which would incorporate the necessary elements of a liquefier in the simplest possible form. Reliability, durability, accessibility, and cost were considered very important factors. The significant features of the liquefier are enumerated. (W.D.M.)

46533 DESIGN OF A CLOSED-CYCLE HELIUM TEMPERATURE REFRIGERATOR. Witter, C. E. (Union Carbide Corp., Tonawanda, N. Y.). Advances Cryog. Eng., 11: 107-15(1966).

Because of the duty cycle and location of most of the applications in the temperature region below 5°K, the need for a simple, highly reliable, closed-cycle refrigerator clearly exists. Five design goals for this type of closed-cycle refrigerator are enumerated. The refrigerator is discussed in terms of cycle selection, expansion engines, heat exchangers, cold box design, compressor package, operation, and test results. (W.D.M.)

46534 CAPACITY AND ECONOMIC PERFORMANCE OF A LARGE 5 DEG K HELIUM REFRIGERATOR. Winters, A. R.; Snow, W. A. (Air Products and Chemicals, Inc., Allentown, Pa.). Advances Cryog. Eng., 11: 116-25 (1966).

A high capacity, 4.5°K, mixed-phase, closed-cycle helium refrigerator was successfully installed and operated. The thermodynamic cycle and equipment arrangement allow a wide versatility in operation as an efficient mixed-phase refrigerator, a dense-gas system, and as a liquefier. The economics of operation were analyzed and are described. Sufficient investment and operating cost information are now available to permit realistic cost comparisons for utilization of large cryogenic refrigerators at or near liquid helium temperature. This, in turn, should help in appraising the merits of using such systems in space simulators, supersonic wind tunnels, bubble chambers, superconducting magnets for particle accelerators, large-scale superconducting electrical generating equipment, and elsewhere. (auth)

46535 COLD-MODERATOR REFRIGERATOR INCORPORATING A HIGH-SPEED TURBINE EXPANDER. Voth, R. O.; Norton, M. T.; Wilson, W. A. (NBS Inst. for Materials Research, Boulder. Colo.). Advances Cryog. Eng., 11: 126-38(1966).

A high-speed turbine expander was built as part of a cold-moderator refrigerator for ANL. The design parameters and the operating characteristics of the turbine expander are presented along with the general requirements of the refrigerator. The refrigerated moderator (20 to 30°K) is to be placed near a reactor to provide an intense beam of low-energy neutrons, and is to operate for continuous periods of up to 6 months. Helium gas was specified as the refrigerator fluid. (W.D.M.)

46536 REFRIGERATION REQUIREMENTS FOR A SUPERCONDUCTING CONTINUOUS-SHEET COMPUTER MEMORY. Atherton, D. L.; Smith, H. J. (Ferranti Electronics, Toronto). Advances Cryog. Eng., 11: 139-51(1966).

The continuous-sheet memory consists of a vacuum-deposited superconducting continuous-sheet memory film of tin evaporated onto a substrate, usually glass, above which are two mutually perpendicular superconducting insulated drive lines. An evaporated sense line system is deposited under the memory plane and insulated from it. To be economically useful the memory must be large. A 3×10^8 bit memory consisting of 132 planes each of 2.3×10^6 bits on a 25-cm square plane with a 150-μ drive line is considered to be an economic size. Calculations are presented based on a 2-μ sec cycle time. The various effects which contribute heat to the memory cryostat are calculated. (W.D.M.)

46537 SUPERCONDUCTING LIQUID-LEVEL SENSOR FOR SLUSH HYDROGEN USE. Knight, B. L.; Timmerhaus, K. D.; Flynn, T. M. (NBS Inst. for Materials Research, Boulder, Colo.). Advances Cryog. Eng., 11: 218-22 (1966).

A system of three superconducting niobium stannide liquid-level sensors was constructed and tested in triple-point liquid hydrogen. Tests indicated that the sensors were capable of detecting, in a linear fashion, the liquid level over a range of about 60% of the total sensor length. One of the sensors was shown to be capable of detecting a liquid-level change on the order of 0.2 cm. Sensitivity of the sensors was investigated and was shown to be a function of the current applied to the sensors as well as a function of several physical characteristics of the sensors themselves. A heat balance was used to obtain an approximation to the measurement error of the sensors. (W.D.M.)

46538 HEAT OF FUSION AND DENSITY OF SOLID PARAHYDROGEN AT PRESSURES TO ABOUT 400 ATMOSPHERES. Lander, H. R. (Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio); Dwyer, R. F.; Cook, G. A. Advances Cryog. Eng., 11: 261-71(1966).

Work on the heat of fusion and slush parahydrogen at pressures up to 400 atm is summarized. The liquid hydrogen used was 99% or more parahydrogen. Besides about 1% orthohydrogen, helium was present in a concentration of less than 10 ppM. Engineering aspects of the work are emphasized in terms of colorimeter assembly, pump assembly, experimental procedure, piezometer assembly, measurements near the melting line, and density correlation. (W.D.M.)

46539 MEASURING THE COMBINED EFFECTS OF NUCLEAR RADIATION AND CRYOTEMPERATURES ON THE TENSILE AND SHEAR PROPERTIES OF MATERIALS. Smith, E. T. (General Dynamics/Fort Worth, Tex.). Advances Cryog. Eng., 11: 478-85(1966).

To prevent any annealing of radiation damage, test requirements specify that specimens remain submerged in liquid nitrogen or liquid hydrogen throughout both the irradiation and post-irradiation phases of the experiments. The unique remote operating devices designed to maintain specimens submerged in boiling cryogen are briefly described. The reactor used for the experiments was the Ground Test Reactor at NARF. Data obtained on the aluminum alloys, stainless steels, nickel alloys, and titanium alloys included 0.2% offset yield stress, tensile stress, fracture stress, true fracture stress, percent reduction in area, notched-to-unnotched tensile strength ratio, percent elongation between shoulders, percent uniform elongation, and percent elongation. (W.D.M.)

46540 EFFECT OF NUCLEAR RADIATION AND LIQUID HYDROGEN ON MECHANICAL PROPERTIES OF THREE PHENOLIC MATERIALS. Weleff, W. (Aerojet-General Corp., Sacramento, Calif.). Advances Cryog. Eng., 11: 486-91(1966).

The mechanical properties of three phenolic based materials (phenolic asbestos-cloth laminate, phenolic linen-cloth laminate, and phenolic glass-cloth laminate) were investigated in a combined environmental condition of liquid hydrogen and nuclear radiation. All three materials tested were standard 0.125-in. sheets. At the radiation dose levels used in the tests all three materials were found suitable for use in liquid hydrogen. (W.D.M.)

46541 BOILING HEAT TRANSFER FROM CYLINDERS IN A SATURATED LIQUID HELIUM II BATH. Holdredge, R. M.; McFadden, P. W. (Purdue Univ., West Lafayette, Ind.). Advances Cryog. Eng., 11: 507-15(1966).

Boiling curves are presented for the regions of Kapitza resistance, non-film boiling, and film boiling. Film boiling data are given on larger test sections than previously has been used. The validity of correlations used in boiling heat transfer in ordinary fluids is discussed. Emphasis is given to the importance of depth as a variable. (W.D.M.)

46542 ELECTRICALLY PUMPED LIQUID HELIUM TRANSFER SYSTEM. Darrel, B.; Schoch, K. (General Electric Co., Schenectady, N. Y.). Advances Cryog. Eng., 11: 607-11(1966).

A liquid helium transfer system is described which is capable of maintaining continuous flow at rates as low as one liter per hour for periods up to several days. A superconducting liquid helium pump and a liquid-level sensing system were also developed for use with this line to automatically maintain a fixed helium level in a cryostat. This system was designed for a cryogenic gyro application in which batch transfer of liquid helium could not be used due to resulting large thermal gradients which cause gyro instrumentation difficulties. (W.D.M.)

46543 HIGH-FIELD LIQUID-NEON-COOLED ELECTROMAGNETS. Brown, G. V.; Coles, W. D. (Lewis Research Center, Cleveland). Advances Cryog. Eng., 11: 638-42(1966).

Two large liquid-neon-cooled electromagnets using very-high aluminum as the conductor material were fabricated, along with the necessary equipment for their operation, and the systems are in preliminary operational status. The $4\frac{1}{2}$-in. bore coils of one electromagnet have produced 200 kG, and when the 12-in. bore coils of the other are operated at the same current, they will produce over 150 kG. The coils were originally conceived as magnetic mirrors for plasma research. The magnets, neon system, magnet tests, and magnet operating characteristics are described. (W.D.M.)

46544 SUPERCONDUCTING MAGNETIC BOTTLE. Laurence, J. C.; Coles, W. D. (Lewis Research Center, Cleveland). Advances Cryog. Eng., 11: 643-51(1966).

A superconducting magnetic bottle consisting of two mirror coils, a central field coil, and a quadrupole (Ioffe) field coil was designed and tests of the components are described. The mirror ratio of the field is 2:1 and the field strength of the mirror coils is 50 kG. The internal diameter of the mirror coils is 4 in. Some degradation in current-carrying capability of the Ioffe field coil was observed due to interaction with the main magnetic field of the bottle when the coils were operated in series. (auth)

46545 CRITICAL STATE OF SUPERCONDUCTING SOLENOIDS. Lubell, M. S. (Westinghouse Electric Corp., Pittsburgh). Advances Cryog. Eng., 11: 652-8 (1966).

It is shown how the Lorentz force-type equation can be applied to solenoids and it is illustrated how the resulting critical state can give a further understanding of another peculiarity of solenoids, namely, "training." The experiments were performed on a solenoid wound with 30m of cold-worked, epoxy-insulated, 0.025-cm dia. Nb–25% Zr wire immersed in liquid helium. The solenoid had the approximate dimensions: 0.3-cm ID, 1.3 cm OD, and 2.8 cm long. (W.D.M.)

46546 PERFORMANCE OF LARGE SUPERCONDUCTING COILS. Laverick, C. (Argonne National Lab., Ill.). Advances Cryog. Eng., 11: 659-67(1966).

Information on the performance characteristics of long lengths of superconducting cable in actual coils is presented in the hope that it may serve as an empirical basis for the design of large magnets. Thirteen large coils have been constructed and tested using a small number of basic cable types of length between 7,500 and 23,000 ft. Four of the coils have been assembled together and operated as a 67-kG magnet system using a total of 261,500 ft of copper-coated 0.010-in. Supercon Nb–25% Zr wire and 220,000 ft of

copper-coated 0.010-in. HI 120, NbTi wire arranged in five different cable types. Three of the coils are currently providing the 44 kG field for an operational 10 in. H–He bubble chamber. (W.D.M.)

46547 CRYOGENICS AND ALUMINUM IN ELECTRICAL MANUFACTURING. Burneir, P. (Alsthom, Paris). Advances Cryog. Eng., 11: 668-74(1966).

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The continuous-sheet memory consists of a vacuum-deposited superconducting continuous-sheet memory film of tin evaporated onto a substrate, usually glass, above which are two mutually perpendicular superconducting insulated drive lines. An evaporated sense line system is deposited under the memory plane and insulated from it. To be economically useful the memory must be large. A 3×10^8 bit memory consisting of 132 planes each of 2.3×10^6 bits on a 25-cm square plane with a 150-μ drive line is considered to be an economic size. Calculations are presented based on a 2-μ sec cycle time. The various effects which contribute heat to the memory cryostat are calculated. (W.D.M.)

46537 SUPERCONDUCTING LIQUID-LEVEL SENSOR FOR SLUSH HYDROGEN USE. Knight, B. L.; Timmerhaus, K. D.; Flynn, T. M. (NBS Inst. for Materials Research, Boulder, Colo.). Advances Cryog. Eng., 11: 218-22 (1966).

A system of three superconducting niobium stannide liquid-level sensors was constructed and tested in triple-point liquid hydrogen. Tests indicated that the sensors were capable of detecting, in a linear fashion, the liquid level over a range of about 60% of the total sensor length. One of the sensors was shown to be capable of detecting a liquid-level change on the order of 0.2 cm. Sensitivity of the sensors was investigated and was shown to be a function of the current applied to the sensors as well as a function of several physical characteristics of the sensors themselves. A heat balance was used to obtain an approximation to the measurement error of the sensors. (W.D.M.)

46538 HEAT OF FUSION AND DENSITY OF SOLID PARAHYDROGEN AT PRESSURES TO ABOUT 400 ATMOSPHERES. Lander, H. R. (Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio); Dwyer, R. F.; Cook, G. A. Advances Cryog. Eng., 11: 261-71(1966).

Work on the heat of fusion and slush parahydrogen at pressures up to 400 atm is summarized. The liquid hydrogen used was 99% or more parahydrogen. Besides about 1% orthohydrogen, helium was present in a concentration of less than 10 ppM. Engineering aspects of the work are emphasized in terms of colorimeter assembly, pump assembly, experimental procedure, piezometer assembly, measurements near the melting line, and density correlation. (W.D.M.)

46539 MEASURING THE COMBINED EFFECTS OF NUCLEAR RADIATION AND CRYOTEMPERATURES ON THE TENSILE AND SHEAR PROPERTIES OF MATERIALS. Smith, E. T. (General Dynamics/Fort Worth, Tex.). Advances Cryog. Eng., 11: 478-85(1966).

To prevent any annealing of radiation damage, test requirements specify that specimens remain submerged in liquid nitrogen or liquid hydrogen throughout both the irradiation and post-irradiation phases of the experiments. The unique remote operating devices designed to maintain specimens submerged in boiling cryogen are briefly described. The reactor used for the experiments was the Ground Test Reactor at NARF. Data obtained on the aluminum alloys, stainless steels, nickel alloys, and titanium alloys included 0.2% offset yield stress, tensile stress, fracture stress, true fracture stress, percent reduction in area, notched-to-unnotched tensile strength ratio, percent elongation between shoulders, percent uniform elongation, and percent elongation. (W.D.M.)

46540 EFFECT OF NUCLEAR RADIATION AND LIQUID HYDROGEN ON MECHANICAL PROPERTIES OF THREE PHENOLIC MATERIALS. Weleff, W. (Aerojet-General Corp., Sacramento, Calif.). Advances Cryog. Eng., 11: 486-91(1966).

The mechanical properties of three phenolic based materials (phenolic asbestos-cloth laminate, phenolic linen-cloth laminate, and phenolic glass-cloth laminate) were investigated in a combined environmental condition of liquid hydrogen and nuclear radiation. All three materials tested were standard 0.125-in. sheets. At the radiation dose levels used in the tests all three materials were found suitable for use in liquid hydrogen. (W.D.M.)

46541 BOILING HEAT TRANSFER FROM CYLINDERS IN A SATURATED LIQUID HELIUM II BATH. Holdredge, R. M.; McFadden, P. W. (Purdue Univ., West Lafayette, Ind.). Advances Cryog. Eng., 11: 507-15(1966).

Boiling curves are presented for the regions of Kapitza resistance, non-film boiling, and film boiling. Film boiling data are given on larger test sections than previously has been used. The validity of correlations used in boiling heat transfer in ordinary fluids is discussed. Emphasis is given to the importance of depth as a variable. (W.D.M.)

46542 ELECTRICALLY PUMPED LIQUID HELIUM TRANSFER SYSTEM. Darrel, B.; Schoch, K. (General Electric Co., Schenectady, N. Y.). Advances Cryog. Eng., 11: 607-11(1966).

A liquid helium transfer system is described which is capable of maintaining continuous flow at rates as low as one liter per hour for periods up to several days. A superconducting liquid helium pump and a liquid-level sensing system were also developed for use with this line to automatically maintain a fixed helium level in a cryostat. This system was designed for a cryogenic gyro application in which batch transfer of liquid helium could not be used due to resulting large thermal gradients which cause gyro instrumentation difficulties. (W.D.M.)

46543 HIGH-FIELD LIQUID-NEON-COOLED ELECTROMAGNETS. Brown, G. V.; Coles, W. D. (Lewis Research Center, Cleveland). Advances Cryog. Eng., 11: 638-42(1966).

Two large liquid-neon-cooled electromagnets using very-high aluminum as the conductor material were fabricated, along with the necessary equipment for their operation, and the systems are in preliminary operational status. The $4\frac{1}{2}$-in. bore coils of one electromagnet have produced 200 kG, and when the 12-in. bore coils of the other are operated at the same current, they will produce over 150 kG. The coils were originally conceived as magnetic mirrors for plasma research. The magnets, neon system, magnet tests, and magnet operating characteristics are described. (W.D.M.)

46544 SUPERCONDUCTING MAGNETIC BOTTLE. Laurence, J. C.; Coles, W. D. (Lewis Research Center, Cleveland). Advances Cryog. Eng., 11: 643-51(1966).

A superconducting magnetic bottle consisting of two mirror coils, a central field coil, and a quadrupole (Ioffe) field coil was designed and tests of the components are described. The mirror ratio of the field is 2:1 and the field strength of the mirror coils is 50 kG. The internal diameter of the mirror coils is 4 in. Some degradation in current-carrying capability of the Ioffe field coil was observed due to interaction with the main magnetic field of the bottle when the coils were operated in series. (auth)

46545 CRITICAL STATE OF SUPERCONDUCTING SOLENOIDS. Lubell, M. S. (Westinghouse Electric Corp., Pittsburgh). Advances Cryog. Eng., 11: 652-8 (1966).

It is shown how the Lorentz force-type equation can be applied to solenoids and it is illustrated how the resulting critical state can give a further understanding of another peculiarity of solenoids, namely, "training." The experiments were performed on a solenoid wound with 30m of cold-worked, epoxy-insulated, 0.025-cm dia. Nb–25% Zr wire immersed in liquid helium. The solenoid had the approximate dimensions: 0.3-cm ID, 1.3 cm OD, and 2.8 cm long. (W.D.M.)

46546 PERFORMANCE OF LARGE SUPERCONDUCTING COILS. Laverick, C. (Argonne National Lab., Ill.). Advances Cryog. Eng., 11: 659-67(1966).

Information on the performance characteristics of long lengths of superconducting cable in actual coils is presented in the hope that it may serve as an empirical basis for the design of large magnets. Thirteen large coils have been constructed and tested using a small number of basic cable types of length between 7,500 and 23,000 ft. Four of the coils have been assembled together and operated as a 67-kG magnet system using a total of 261,500 ft of copper-coated 0.010-in. Supercon Nb–25% Zr wire and 220,000 ft of

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46557 (NAA-SR-Memo-11892) AILMOE: ATOMICS INTERNATIONAL'S VERSION OF THE ELMOE CODE. (NAA PROGRAM DESCRIPTION). Blaine, R. A. (Atomics International, Canoga Park, Calif.). Apr. 1966. Contract AT(11-1)-Gen-8. 26p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A computer code is described which calculates the Fourier transform of the fast-neutron flux for a mixture of moderators heavier than hydrogen with the moderator scattering law rigorously taken into account. An option is provided to iterate on buckling until a neutron balance condition is satisfied, or to provide multigroup bucklings. Twenty-four coarse groups are included for slowly varying cross sections with option to supply coarse and/or fine group data. 750 fine groups can be used for elastic scattering based on a 1500-point Legendre coefficient library. Additional features are restart option to bypass light element, elastic scattering matrix calculation, and punched output containing energy, fluxes, and current. (auth)

46558 (ORNL-3856) ACTIFK: A GENERAL ANALYSIS CODE FOR O5R. Kam, F. B. K.; Franz, K. D. (Oak Ridge National Lab., Tenn.). Sept. 1966. Contract W-7405-eng-26. 142p. Dep. mn. CFSTI $4.00 cy, $1.00 mn.

The ACTIFK 05R-analysis code was written to facilitate the analysis of the collision tapes generated by the 05R neutron transport code. The code was successfully applied to a wide range of problems and reduced considerably the time previously required to achieve an operational program. ACTIFK requires that subroutines be written before it can be used. However, this disadvantage is minor when the user considers the following advantages: any of the methods of analysis already written can be used; any nonelastic event can be treated; most of the bookkeeping tasks, such as tape reading and writing, initialization of parameters, finding the proper cross sections, checking for any overlapping of data and programs, etc., have been built into the code; optional statistical analysis subroutines are included which are useful in determining the significance of the Monte Carlo results; and very little coding effort is required. (auth)

46559 (ORNL-P-2493) NEUTRON CROSS SECTIONS AND RELATED MEASUREMENTS. Harvey, J. A. (Oak Ridge National Lab., Tenn.). [1966]. Contract W-7405-eng-26. 25p. (CONF-660925-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Seminar on Intense Neutron Sources, Santa Fe, N. Mex.

Source-intensity requirements for cross-section measurements with fast neutrons and resonance neutrons are discussed. Cross sections for reactor calculations and for studies of nuclear structure are considered. Multiparameter experiments on nuclear structure are discussed in detail. (D.C.W.)

46560 (ORNL-TM-1552) A NOTE ON SUBROUTINE CEASE (05R:EVAP), A MODIFICATION OF EVAP IN 05R. Straker, E. A.; Cain, V. R. (Oak Ridge National Lab., Tenn.). Aug. 31, 1966. Contract W-7405-eng-26. 5p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

The use of the evaporation model for inelastic scattering in light nuclei is discussed. Also, modifications to the 05R subroutine EVAP to provide better continuity in the scattered neutron energy distribution determined from level structure data and from the evaporation model are considered. A selection technique for picking from the distribution is also given. (auth)

46561 (RPI-328-68, pp 63-83) FAST NEUTRON SPECTRUM PROGRAM. (Rensselaer Polytechnic Inst., Troy, N. Y.).

A broad program is described for the measurement of fast neutron spectra in various materials under a variety of conditions. The objectives of the program are to investigate fast and intermediate neutron energy spectra in materials and configurations which find direct application as components of large fast breeder reactors with pronounced spectral degradation and to study high-energy neutron spectra in systems in which the primary mechanism of neutron moderation is inelastic scattering and the angular distributions of elastically scattered neutrons generally have large anisotropies. In these necessarily small systems the applicability of diffusion theory is open to question and the measured spectra provide sensitive checks to the validity of transport theory methods. The time-of-flight technique was used in the studies, using high-intensity, short-duration neutron bursts from a linear accelerator source. Supplementary foil activation methods were also used. (S.F.L.)

46562 (RPI-328-68, pp 84-144) NEUTRON THERMALIZATION. (Rensselaer Polytechnic Inst., Troy, N. Y.).

A one-group numerical calculation was made to determine the effect of holes on the extrapolation distance for thermal neutrons in water. Calculations were made of the time-dependent neutron spectrum produced by the injection of a burst of high-energy neutrons into a cubical sample of D_2O. The calculation was performed using time- and energy-dependent diffusion theory for each spatial mode, with higher spatial harmonics explicitly included. Spatially dependent neutron spectra were measured in a non-multiplying medium composed of a homogeneous mixture of ZrO_2 dispersed in paraffin and in a multiplying medium composed of enriched ^{235}U dispersed in the same mixture. Comparison was made between the experimental results and calculations based on thermal transport theory. The experimental equipment is described. A pulsed-source time-of-flight technique was used to measure the mean emission time of neutrons in a multiplying medium, and graphical results are given. Improvements are reported for neutron detection instruments and for a time-of-flight spectrometer used to obtain time-dependent neutron spectra. A description is given of the bracketing procedure for direct measurement of reactivity in reactors. (S.F.L.)

46563 (RPI-328-68, pp 145-60) LOW ENERGY NEUTRON INELASTIC SCATTERING (LENIS). (Rensselaer Polytechnic Inst., Troy, N. Y.).

Differential cross sections were measured for neutron inelastic scattering on polyethylene at 0.232 ev and on ZrH_2 at 0.238 ev. The angular distribution and the shape of the scattered peak for the first bound level of ZrH_2 compared favorably with theory. (S.F.L.)

46564 PHYSICS OF PULSED NEUTRONS. Cokinos, Dimitrios (Columbia Univ., New York). Advances Nucl. Sci. Technol., 3: 1-142(1966).

A review of experimental and theoretical work in pulsed-neutron physics is presented. Theoretical aspects of the thermalization and diffusion of pulsed neutrons in moderating media are reviewed, and methods for calculating thermal-neutron spectra are discussed. The status of the theory of the diffusion cooling of neutrons is surveyed, and some experimental results obtained with pulsed sources in moderating media are presented. Methods used in studying parameters associated with multiplying media are reviewed, and the characteristics of pulsed neutron sources are discussed. Neutron-wave methods are also covered. 372 references. (D.C.W.)

46565 PULSED NEUTRON SOURCES. Stahl, R. H.; Russell, J. L. Jr.; Hopkins, G. R. (General Atomic Div., General Dynamics Corp., San Diego, Calif.). Advances Nucl. Sci. Technol., 3: 329-81(1966).

The use of electron linear accelerators, proton synchrocyclotrons, medium-energy accelerators, thermal reactors, and fast reactors as pulsed neutron sources is discussed. (S.F.L.)

46566 SLOWING DOWN SPECTRUM AND NEUTRON TEMPERATURE IN A THERMAL NEUTRON FLUX DENSITY STANDARD. Geiger, K. W.; van der Zwan, L.

(National Research Council, Ottawa). Metrologia, 2: 1-5(Jan. 1966).

Epithermal and thermal flux parameters for the thermal flux density standard at the National Research Council were measured to allow a more accurate calculation of activation rates. The epithermal spectrum was found to follow a $E^{-0.95}$ law where E is the neutron energy. The effective neutron temperature in the irradiation cavity was found to be 42°C, which is 22°C higher than the moderator temperature. A formula to calculate the reaction rate is given. (auth)

46567 THE EFFECT OF RANDOMNESS ON GROUP CROSS SECTIONS. II. Kelber, Charles N.; Kier, Philip H. Nucl. Sci. Eng., 26: 67-72(Sept. 1966).

A model is developed for the estimation of the Doppler effect from the unresolved energy region for fissile nuclides. For energy intervals that contain enough resonances for the reaction rates to be statistically independent of neighboring intervals, many resonance structures, or ladders, are generated by a random process that preserves the average widths and strength function. For each ladder, the relative changes in the absorption and the fission rates with temperature are computed, including overlap effects. This procedure yields estimates of mean quantities and the dispersion of values about the mean when the reaction rates are regarded as random variables. The Doppler effect and its variance are obtained by incorporating these resonance integral calculations into a multigroup-perturbation theory formulation. This model has been used to estimate the Doppler effect for ^{239}Pu in the Codd and Collins mixture. For a temperature change from 300 to 600°K, the contributions to $\Delta k/k$ from the unresolved region (215 ev to 10 kev) and the resolved region (<215 ev) were calculated to be 290×10^{-6} and 440×10^{-6}, respectively. The probable error, or $\approx^2/_3$ standard deviation in the Doppler effect, assumed to be solely from the unresolved region, was $\pm 290 \times 10^{-6}$. (auth)

46568 AGE OF FISSION NEUTRONS TO INDIUM RESONANCE ENERGY IN ALUMINUM–WATER MIXTURES. Paschall, R. K. Nucl. Sci. Eng., 26: 73-9(Sept. 1966).

The age of fission neutrons to indium resonance energy (1.46 ev) was measured in mixtures of aluminum and water. Three different volume ratios of metal-to-water were investigated. The technique of a finite-plane fission source with essentially infinite-plane detectors was used previously at this laboratory to measure the age in pure water, mixtures of zirconium and water, and mixtures of iron and water. Similar to the iron-water mixtures, but in contrast to the zirconium water mixtures, the general curve of age vs metal-to-water ratio is not a linear function with aluminum-water mixtures. The curvature is caused by inelastic scattering in the iron and aluminum. For metal-to-water ratios of 0.25, 0.50, and 1.0, this experiment gave ages of 33.9 ± 0.6 cm^2, 43.2 ± 0.8 cm^2, and 59.6 ± 0.9 cm^2, respectively. (auth)

46569 NEW DEVELOPMENTS IN THE REACTOR THFORY AND NEUTRON TRANSPORT. Zelazny, Roman (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 79-98(1966).

A review of Polish efforts devoted to the generalization and application of the eigenfunctions expansion method to the solution of neutron transport problems is given. After the formulation of the essence of the method on the example of the Boltzmann equation with the isotropic scattering,of neutrons the extension towards anisotropic scattering of neutrons is presented. Then the problem of energy dependent neutron transport is discussed using the multigroup approach and the case of continuous energy dependence. Examples of practical relevance are given. In the end the time dependent problems encountered in the neutron transport theory are discussed from the point of view of spectral properties of Boltzmann operator. (auth)

46570 DIFFUSION PARAMETERS MEASUREMENTS BY MEANS OF PULSED NEUTRON METHOD. Graffstein, Andrzej; Rzeszot, Tadeusz; Warda, Eugeniusz (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 277-85(1966).

Neutron diffusion parameters of organic glass and epoxy resin were measured using the pulsed neutron method. The fast chopper operating at the horizontal channel of the reactor EWA was used as a pulse neutron source. The measurements were performed in the range of great bucklings. The diffusion parameters of organic glass and epoxy are presented. (auth)

46571 COLD NEUTRON SCATTERING FROM LIQUID CD_4. Venkataraman, G.; Dasannacharya, B. A.; Rao, K. R. (Atomic Energy Establishment, Trombay, India). Phys. Lett., 23: 226-7(Oct. 17, 1966).

The scattering of cold neutrons by liquid CD_4 was investigated. The results for the quasi-elastic width are discussed in terms of a new model to describe interference effects. (auth)

46572 GENERATION OF A NEUTRON BEAM FOR MEASURING SMALL-ANGLE-SCATTERING CROSS SECTION. Gorlov, G. V.; Kirillov, A. I.; Lebedeva, N. S. (Inst. of Atomic Energy, Moscow). Prib. Tekh. Eksp., No. 3, 27-30(May-June 1966). (In Russian).

A diagram is shown of a liquid-nitrogen-cooled rotary target and a variable-aperture wedge-shaped-canal collimator, which are intended for generating small-angle medium-energy neutron beams. The beams are used for measuring differential small-angle-scattering (up to 0.5°) cross sections. Results are reported of measuring the shape of collimated neutron beam, from a D-D reaction: $E_n = 4$ Mev; aperture, 1° (solid angle, 0.0003 ster). The neutron-density distribution in the beam is practically rectangular. Total collimator flux, 4×10^5 neutrons/sec; $E_d = 1400$ kev; energy loss in the heavy-ice layer, $\Delta E = 400$ kev; deutron current, 40 μa; total target yield, 1.7×10^9 neutrons/sec. (ATD)

46573 RANDOM WALK OF NEUTRONS IN A MODERATOR CONTAINING HOLES. Sekiya, Tamotsu (Osaka Univ.); Murase, Hirokazu. Technol. Rep. Osaka Univ., 16: 175-9(Mar. 1966).

A general survey of concepts of spatial moments of neutron distribution is presented including theory, experimental verifications, and directions of possible generalizations of the method using analytical as well as sampling methods. It is emphasized that the Monte Carlo calculation may be made in a relatively short time contrary to failures of many experts in shielding calculations. (NSA of Japan)

46574 NEUTRON TIME-OF-FLIGHT TECHNIQUES. Finlay, Roger W. (Ohio Univ., Athens). 11p. (CONF-660430–2). ORAU. Gmelin, AED-CONF-66-105-2.

From Ohio Academy of Science, 75th Annual Meeting, Columbus, Ohio.

The difficulties involved in using time-of-flight techniques with fast neutrons are briefly discussed, and a time-of-flight system that is based on a crossover-pickoff technique is described. As an example of the performance of the system, angular distributions obtained for neutrons scattered from B, Ca, C, and K are presented and are compared with optical-model calculations. (D.C.W.)

46575 EFFECT OF THRESHOLD CROSS SECTION ON THE DERIVATION OF FAST-NEUTRON SPECTRA. Levine, S. H.; Fortney, R. E. (Northrop Space Labs., Hawthorne, Calif.). 22p. (CONF-660303–38). ORAU. Gmelin, AED-CONF-66-034-23.

From American Physical Society, Conference of Neutron Cross Section Technology, Washington, D. C.

The effect of errors in cross-section data on deriving fast-neutron spectra between 1 and 10 Mev from experimental threshold activation data was studied arbitrarily varying published cross sections about a reference set of cross-section data. The study utilizes an iteration method which derives a spectrum that is a function of experimental data only; ^{237}Np(n,f), ^{239}U(n,f), ^{32}S(n,p), ^{27}Al(n,p), ^{56}Fe(n,p), and ^{27}Al(n,α) reactions are used in this study. Also, the importance of these spectral changes are discussed in reference to important parameters and spectral shapes. (auth)

46576 APPARATUS FOR PRODUCING INTENSE BUNCHED BEAMS OF MONOENERGETIC NEUTRONS.

Van de Graaff, Robert J. (to High Voltage Engineering Corp.). U. S. Patent 3,268,730. Aug. 23, 1966. Filed Feb. 28, 1963.

An apparatus for the production of intense bunched beams of monoenergetic neutrons is described in which bunching is accomplished without bunching the ion beam. (D.C.W.)

Nuclear Properties and Reactions

Refer also to abstracts 45589, 45728, 45748, 46342, 46400, and 46933.

46577 (AD–630032) (p,n) REACTION ON ^{91}Zr FOLLOWED BY PROTON EMISSION. Yavin, A. I.; Hoffswell, R. A.; Noweir, T. M. (Illinois Univ., Urbana). 1966. 13p. CFSTI $1.60 cy, $0.50 mn.

The reaction ^{91}Zr(p,n)^{91}Nb, where ^{91}Nb denotes the isobaric analogue of the ground state of ^{91}Zr, was investigated by observing the proton decay of ^{91}Nb. Proton spectra corresponding to 13.0, 13.15, and 13.3 Mev incident proton energies were recorded. The three spectra were then added in order to accentuate any proton group with energy largely independent of the incident proton energy. This procedure broadened extensively all proton peaks with the exception of one. It is strongly suggested that this peak results from the proton decay ^{91}Nb to the ground state of ^{90}Zr. The observed energy release in this decay was 4.70 ± 0.10 Mev. The Coulomb displacement energy is therefore 11.90 ± 0.10 Mev. The observed integrated cross section for the ^{91}Zr(p,n)^{91}Nb reaction assuming isotropic decay for ^{91}Nb, was approximately 5 mb. As expected, no such effect was observed when ^{90}Zr was used as a target. (auth)

46578 (AE–242) HALF LIFE MEASUREMENTS IN ^{155}Gd. Malmskog, S. G. (Aktiebolaget Atomenergi, Stockholm (Sweden)). Aug. 1966. 10p. Dep. mn.

In the literature there exists a definite difference for the half life of the 86.5-kev level in ^{155}Gd depending on whether ^{155}Eu or ^{155}Tb sources were used. Using an electron-electron coincidence spectrometer with good energy resolution and a ^{155}Eu source, a half life of 6.48 ± 0.26 nsec was obtained for the 86.5-kev level. This is in agreement with the values previously measured with ^{155}Tb sources. The half life of the 105.4-kev level was measured to be 1.12 ± 0.05 nsec. (auth)

46579 (AERE-NP–GEN-9) THE SLOW NEUTRON TOTAL CROSS SECTION OF ^{240}Pu. Pattenden, N. J.; Rainey, V. S. (Atomic Energy Research Establishment, Harwell (England)). Mar. 1959. 10p. Dep. mn.

The total neutron cross section of ^{240}Pu was measured over an energy range from 0.01 to 10 ev using crystal spectrometers. The observations may be fitted by a single-level Breit-Wigner relation with parameters E_0 = 1.0575 ev, Γ_γ = 29.6 Mev, and Γ_n^0 = 2.40 Mev. The results are compared with other published data. (auth)

46580 (BMWF-FBK–66-05) JAHRESBERICHT 1965. (Annual Report, 1965). (Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany)). Apr. 1966. 200p. Dep. mn.

46581 (CEA-R–2876) MISE EN EVIDENCE DES FLUCTUATIONS DE SECTIONS EFFICACES DU MODELE STATISTIQUE PAR L'ETUDE DE LA REACTION ^{27}Al(d,alpha)^{25}Mg. (Evidence for Fluctuations in Statistical Model Cross Sections From the Study of ^{27}Al(d,alpha)^{25}Mg Reaction). Papineau, Lily (Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires). 1966. 96p. Dep. mn.

Thesis. Submitted to Paris Univ., France. Faculte des Sciences.

A complete set of experimental data was obtained for the reaction ^{27}Al(d,α)^{25}Mg for excitation energies in the compound nucleus ^{29}Si between 19.7 and 27.4 Mev, and comparisons were made with the theoretical predictions of the statistical model of nuclear reactions including fluctuations. Numerical calculations of the theoretical cross sections were made, and contributions to methods of analysis of fluctuating excitation functions are given. The results confirm strong evidence for statistical fluctuations in nuclear cross sections. (auth)

46582 (COO–1420-126(Vol.1)) ANGULAR CORRELATION HANDBOOK. VOL. I. UNPERTURBED DIRECTIONAL CORRELATIONS. Steffen, R. M. (Purdue Univ., Lafayette, Ind. Dept. of Physics). Aug. 1965. Contract AT(11-1)-1420. 152p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

Formulas, graphs, and tables for use in experimental work on angular correlations are given. Information on correlations involving gamma rays, conversion electrons, alpha particles, and beta particles is presented including correlation functions, correlation coefficients, matrix elements, and particle parameters. (D.C.W.)

46583 (IKF–17) NEUTRON ABSORPTION CROSS SECTIONS AND TRANSMISSION COEFFICIENTS FROM A NON-LOCAL OPTICAL MODEL. Lindner, Albrecht (Institut fuer Kernphysik, Universitaet Frankfurt (West Germany)). July 1966. 49p. (EANDC(E)–73(U)). Dep. mn.

Absorption cross sections and transmission coefficients for neutrons were calculated with the non-local optical potential of Perey and Buck. They are given in diagrams as functions of A for A = 20 to 240 and E_n = 0.1 to 25 Mev. In addition some published interpolation formulas for the absorption cross sections are compared with experimental data. (auth)

46584 (INP–472/PL) PROGRAM DLA MASZYNY CYFROWEJ UMC-1 NA OBLICZENIE CZASU ZYCIA STANU JADROWEGO WYZNACZONEGO METODA OPOZNIONYCH KOINCYDENCJI. (The Program for the Digital Computer UMC-1 for the Calculation of a Life Time of an Excited State Measured by Delayed Coincidences). Janiszewska, Alicja; Pytkowicz, Gustav (Institute of Nuclear Physics, Krakow (Poland)). Apr. 1966. 11p. Dep.

A computer program is described which evaluates the coefficients a and b in the equation $\ln N_i = a + b\, t_i$, where N_i is the number of delayed coincidences, and t_i is the delay time. The program also calculates the error Δb. (auth)

46585 (INP–482/PL) ON THE MAGNETIC PROPERTIES OF THE ^{171}Tm NUCLEUS. Bochnacki, Z.; Ogaza, S. (Institute of Nuclear Physics, Krakow (Poland)). June 1966. 11p. Dep.

The available experimental data on the magnetic properties of the ground state K = $\frac{1}{2}$ rotational band of the ^{171}Tm nucleus were analyzed in terms of the effective spin g-factors. It is shown that these data can be explained by taking into account a spin polarization of the even core by the odd proton, if the transverse spin polarization is different from the longitudinal polarization. (auth)

46586 (JINR-P–2769) POLUCHENIE SPONTANNO DELYASHCHIKHSYA IZOMEROV ^{240}Am I ^{242}Am V REAKTSIYAKH PEREDACHI NEITRONA. (Production of Spontaneously Fissioning ^{240}Am and ^{242}Am Isomers in Neutron Transfer Reactions). Gangrskii, Yu. P.; Gvozdev, B. A.; Markov, B. N.; Polikanov, S. M.; Yungklaussen, G. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Reactions). 1966. 7p. Dep. mn.

Targets of ^{243}Am and ^{241}Am with a thickness of 0.5 mg/cm^2 were irradiated with ^{22}Ne ions from the internal beam of a 310-cm cyclotron. The recoil nuclei knocked out of the target were collected on a moving nickel foil and were conveyed to silicate glasses which served as fission product detectors. The following neutron transfer reactions were investigated: ^{243}Am + ^{22}Ne → ^{242}Am + ^{23}Ne; ^{241}Am + ^{22}Ne → ^{240}Am + ^{23}Ne; and ^{241}Am + ^{22}Ne → ^{242}Am + ^{21}Ne. The spontaneously fissioning isomer had a half life of 14 msec for ^{242}Am and 0.6 msec for ^{240}Am. The yield of ^{242}Am in the ground state was determined by carrying out a chemical separation of americium from the other reaction products and counting the alpha activity of the ^{242}Cm daughter product. The ratio of isomers did not depend on the energy of the bombarding ions and was found to be equal to ~10^{-5}. On bombarding ^{241}Am with ^{22}Ne ions,

^{240}Am but not ^{242}Am was detected. In this case the yield of ^{242}Am in the ground state was about the same as on irradiating ^{243}Am. The Q values were −1.08, −1.44, and −4.87 for the three reactions, respectively. The cross section for the formation of the spontaneously fissioning isomer were 0.18, 0.10, and $<8 \times 10^{-8}$ microbarns for the three reactions, respectively. The ratio of the cross section for isomer formation to the cross section for the formation of the ground-state nucleus was 2.9×10^{-5} for the first reaction and $<2 \times 10^{-6}$ for the third reaction. (TTT)

46587 (JINR-P-2794) O REAKTSII PEREDACHI PROTONA V SLABOSVYAZANNOE SASTOYANIE. (Proton Transfer in a Weakly Bound State). Gareev, F. A.; Kalinkin, B. N. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics). 1966. 6p. Dep. mn.

The angular distributions of products of proton transfer to weakly bound states in the reactions $^{51}V(^{12}C,^{13}N)^{50}Ti$ and $^{93}Nb(^{12}C,^{13}N)^{92}Zr$ were measured. The variation of the proton transfer cross section with the nuclear charge of the target was considered, as was the polarization effect due to the nuclear Coulomb field. (D.C.W.)

46588 (LA-DC-7853) PULSED FAST NEUTRON RESEARCH AT THE LOS ALAMOS VAN DE GRAAFF ACCELERATOR. Conde, H.; Drake, D. M.; Hopkins, J. C.; Keaton, P. W.; Seagrave, J. D.; Smith, R. K.; Stein, W. E.; Sattler, A. R. (Los Alamos Scientific Lab., Univ. of California, N. Mex.). [1965]. Contract W-7405-eng-36. 18p. (CONF-661014-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From IAEA Conference on Nuclear Data, Paris, France.

A description is given of a Van de Graaff accelerator facility capable of producing a chopped beam of protons or deuterons in the energy range 1.5 to 8.0 Mev. The pulse length, from the accelerator, is variable from 2 to 10 nsec with a repetition rate of 2 MHz and an average current from 2 to 10 μa. A Mobley magnet system is used to compress the pulse length to 1 nsec. The neutron sources are the T(p,n)^{3}He reaction for neutrons with energies up to 5 Mev, the D(d,n)^{3}He reaction for neutron energies between 5 and 9 Mev, and the T(d,n)^{4}He reaction for neutron energies between 17 and 22 Mev. Data are presented on the gamma spectra from the reactions $^{12}C(n,n'\gamma)^{12}C$ and $^{28}Si(n,n'\gamma)^{28}Si$ at 7.5 Mev incident neutron energy; the differential cross section of the 4.43-Mev gamma ray produced in the reaction $^{12}C(n,n'\gamma)^{12}C$ at 6.0, 7.0, and 7.5 Mev incident neutron energy; the time spectrum of neutrons elastically and inelastically scattered from Si at 7.5 Mev at a laboratory angle of 135°; the angular distribution of neutrons elastically scattered from Si at 7.5 Mev; the differential inelastic cross sections for ^{28}Si at 7.5-Mev incident neutron energy; the neutron elastic differential cross sections from deuterium at 8 Mev; and the relative fission cross sections $\sigma(^{237}Np)/\sigma(^{235}U)$ and $\sigma(^{238}U)/\sigma(^{235}U)$. (S.F.L.)

46589 (NP-16185) NUMERICAL RESULTS OF MULTIPLE COULOMB EXCITATION. Alder, K.; Bierter, W.; Simonius, M.; Zwicky, A. (Basel Univ. (Switzerland)). 1965. 48p. Dep. mn.

Tables are given of numerical results from calculations on multiple Coulomb excitation of nuclei. The values tabulated are excitation probabilities, total cross sections, and coefficients for the angular distribution of the de-excitation γ rays. (S.F.L.)

46590 (NP-16309) DIFRAKTSIONNOE VZAIMODEĬSTVIE NUKLONOV I SLOZHNYKH CHASTIĬ S YADRAMI. (Diffraction Interaction of Nucleons and Complex Particles with Nuclei). Berezhnoi, Yu. A. (Akademiya Nauk Ukrainskoi SSR, Kharkov. Fiziko-Tekhnicheskii Institut). 1964. 74p. Dep. mn.

Thesis.

Diffraction interaction of nucleons and complex particles with nuclei was thoroughly investigated theoretically using the diffraction model. The diffraction scattering of nucleons and deuterons by nuclei, diffraction interactions of deuterons and complex particles with nuclei, and the inelastic diffraction scattering of particles on nuclei are discussed. Analytical expressions for various types of cross sections are used for the interpretation of experimental data and for extracting from the data information on the dimensions of nuclei, the magnitude of collective matrix elements, the size of the fringe region of the nuclear boundary, the length of particle mean free path within the nuclei, etc. A lack of experimental data prevented an extended comparison of theoretical formulas with experiment. (JPRS)

46591 (NYO-2262TA-129) ANALYSIS OF THE ELASTIC SCATTERING OF PROTONS AT HIGH ENERGY AND MOMENTUM TRANSFER USING THE SERBER MODEL AND BAKAMJIAN-THOMAS THEORY. Avison, David (Brown Univ., Providence, R. I. Dept. of Physics). June 1966. Contract AT(30-1)-2262. 89p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

The Serber model for describing proton-proton scattering was investigated in detail at two laboratory momenta, 11.26, and 30.0 Bev/c, by carrying out a partial-wave computation with the potential $A = (A_0, \underline{A}) = (ine^{-Ar}/r, 0, 0, 0)$ inserted into the Klein-Gordon equation $[(p_{op} - \underline{A})^2 + m^2]\Psi = (E - A_0)^2\Psi$. The two resulting momentum-transfer distributions obtained differ from those obtained by Serber, who used an optical approximation. Both curves are raised above Serber's in the high momentum-transfer region. This causes the 11.26 Bev/c curve to be in better agreement with the data and the 30.0 Bev/c curve to "overshoot" the data yielding worse agreement. The raising of these momentum-transfer curves in the high momentum-transfer region is due to the appearance of a real part in the low angular-momentum contributions to the scattering amplitude. The Bakamjiam-Thomas theory was used to obtain relativistic scattering equations for the relative motion. These are presented in a squared and in an unsquared form and both forms are realized in Cartesian coordinates and reduced to partial wave equations for the case of an isotropic potential dependent only on the B.-T. relative coordinate. These equations are shown to bear a resemblance to the Klein-Gordon equation with Serber's potential A. The first Born approximation of the scattering amplitude as calculated from the Bakamjian-Thomas equations and from the Klein-Gordon equation are shown to agree as $k \to \infty$. Differences between these approaches are expected to show up mainly at large-angle scattering since the (unsquared) Bakamjian-Thomas Green's function differs appreciably from that of the Klein-Gordon equation only for small r. (auth)

46592 (ORNL-3973(Vol.1), pp 1-13) NUCLEAR AND REACTOR PHYSICS. (Oak Ridge National Lab., Tenn.).

Excitation energies for 23 levels of ^{94}Zr between 0.92 and 4.25 Mev are reported. The levels were excited by proton scattering and the analysis used eight pulse-height spectra for laboratory angles between 40 and 80°. The pulse-height spectrum is given for protons scattered at 50°, and recommended values for spin and parity for the 23 levels are tabulated. Simultaneous measurements of the capture and fission cross sections of ^{235}U were analyzed. A figure showing the fission and capture cross sections and their ratio σ_c/σ_f in the energy range 1 to 10 ev, and a table giving the fission and capture resonance integrals over 0.25 lethargy intervals are presented. The neutron spectrum of the Bulk Shielding Reactor was measured from thermal energies to 10^5 ev. A discussion is given of several problems experienced in the operation of the Health Physics Research Reactor, including variations of ±40% in the neutron pulses. Progress is also reported on the construction of an electron linear accelerator to be used as a source of short intense pulses of neutrons. (S.F.L.)

46593 (ORNL-P-2437) FORM FACTORS FOR DWBA CALCULATIONS OF THE $^{54,52,50}Cr(^3He,\alpha)$ REACTIONS LEADING TO ISOBARIC ANALOG STATES. Stock, R.; Bock, R.; von Brentano, P.; Duhm, H. H. (Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany). Oak Ridge National Lab., Tenn.). [1966]. Contract W-7405-eng-26. 11p. (CONF-660906-22). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Nuclear Physics, Gatlinburg, Tenn.

The reactions $^{50}Cr(^3He,\alpha)$, $^{52}Cr(^3He,\alpha)$, and $^{54}Cr(^3He,\alpha)$ were analyzed at E(^{3}He) = 18 Mev by the DWBA method. It was found that if proper account of the t-T interaction is taken in computing the wave function of the picked-up neutrons to be used as form factors, all the derived spectroscopic factors for both $T - \frac{1}{2}$ and $T + \frac{1}{2}$ states are in good agreement with the French-MacFarlane sum rule. (auth)

46594 (ORNL-P-2438) ANALYSIS OF THE ANALOGUE STATE RESONANCES IN $^{208}Pb(p,p_0)^{208}Pb$ AND $^{208}Pb(p,p')^{208}Pb^*$ PROCESSES. Tamura, Taro (Oak Ridge National Lab., Tenn.). [1966]. Contract W-7405-eng-26. 7p. (CONF-660906-18). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Nuclear Physics, Gatlinburg, Tenn.

Analysis was made of the data on the analogue state resonances in the $^{208}Pb(p,p_0)^{208}Pb$ and $^{208}Pb(p,p')^{208}Pb^*$ processes in terms of an extended coupled-channel calculation. Rather good agreement with experiment was obtained. The derived spectroscopic factor was also in accord with that obtained from a (d,p) analysis. (auth)

46595 (ORO-2098-49) EVIDENCE FOR A DOUBLET AT 5.96 Mev IN ^{10}Be. Technical Report No. 538. Young, F. C.; Forsyth, P. D.; Roush, M. L.; Hornyak, W. F. (Maryland Univ., College Park. Dept. of Physics and Astronomy). Jan. 1966. Contract AT(40-1)-2098. 15p. (CONF-651118-18). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From American Physical Society, Gatlinburg, Tenn.

By using the $^9Be(d,p\gamma)^{10}Be$ reaction to populate the 5.96-Mev state in ^{10}Be, gamma coincidence spectra were measured across the proton group corresponding to this state. The protons were detected with a solid-state detector at the exit of a magnetic spectrometer, which was used to scan the proton group. The yields of the cascade gamma rays (2.59 and 3.37 Mev) and the crossover gamma ray (5.96 Mev) were extracted from coincidence spectra measured with a 3 in. × 3 in. NaI crystal. The ratio of the cascade yield to the crossover yield is observed to change by a factor of 2 across the proton group. This variation of the branching ratio across the level is interpreted as evidence for the existence of two closely spaced levels at 5.96-Mev excitation. These two levels are separated by about 1 kev. The higher-energy member of this doublet decays predominately by the crossover transition and has $J^\pi = 1^-$. The lower-energy member decays predominately by the cascade transition and has $J^\pi = 2^+$. (auth)

46596 (PUC-937-211) NUCLEAR SPECTROSCOPY IN THE $1f_{\frac{7}{2}}$ REGION BY THE (p,d) AND (p,t) REACTIONS. Whitten, Charles A. Jr. (Princeton Univ., N. J. Palmer Physical Lab.). May 1966. Contract AT(30-1)-937. 202p. Dep. mn. CFSTI $6.00 cy, $0.25 mn.

Thesis

The $^{40}Ar(p,d)$ and (p,t), $^{51}V(p,d)$ and (p,t), $^{53}Cr(p,d)$ and (p,t), $^{54}Cr(p,d)$ and (p,t), and $^{53}Cr(p,p')$ reactions were studied using 17.5-Mev protons. Thin (~0.5 mg/cm^2) isotopic foils were used as targets in the vanadium and chromium reaction studies while a gas cell was used in the argon experiment. The deuterons and tritons were identified by a dE/dx−E solid state detector telescope. Total resolution of the system was ~55 to 70 kev. Absolute cross sections for the vanadium and chromium reactions were obtained using thick natural target foils. Angular distributions for many (p,d) and (p,t) transitions were obtained from θ_{lab} = 15° to 150°. Spectroscopic factors for $l_n = 0$, $l_n = 1$, $l_n = 2$, and $l_n = 3$ for (p,d) transitions were obtained by comparing the experimental angular distributions with the predictions of the distorted wave Born approximation (DWBA) theory of the (p,d) reaction. The DWBA program we used approximated both finite range and non-local effects in the reaction mechanism. The $l_n = 3$ ($j_n = \frac{7}{2}$) spectroscopic factors in the $^{51}V(p,d)^{50}V$ and $^{52}Cr(p,d)^{51}Cr$ reactions were compared with the predictions of the McCullen, Bayman, and Zamick theory, which assumes pure $(f^n_{\frac{7}{2}})$ configurations for the levels in ^{50}V and ^{51}Cr. In the $^{53}Cr(p,d)$ reaction both the ^{52}Cr ground state and the 1.434 Mev 2^+ level were excited by $l_n = 1$ transitions, showing admixture in the ^{53}Cr ground state of the configuration $\{[^{52}Cr(1.434\ Mev)]^{2+}\ 2p_{\frac{3}{2}}\}^{\frac{5}{2}}$. Four levels in ^{52}Cr with excitation energies between 3.4 and 4.1 Mev were strongly excited in the (p,d) reaction by $l_n = 3$ transitions, thus presenting strong evidence that their wave functions have large admixtures of the neutron configuration $(f^{-1}_{\frac{7}{2}}p_{\frac{3}{2}})^{J=2,3,4,5}$. In the $^{54}Cr(p,d)^{53}Cr$ reaction definite J dependence was seen in both the $l_n = 1$ ($J = \frac{1}{2}$ or $\frac{3}{2}$) and $l_n = 3$ ($J = \frac{5}{2}$ or $\frac{7}{2}$) (p,d) angular distributions. Strong $l_n = 3$ $^{54}Cr(p,d)$ transitions were found to $\frac{7}{2}^-$ levels in ^{53}Cr at 1.284, 1.532, and 3.339 Mev. In both the $^{54}Cr(p,d)$ and $^{52}Cr(p,d)$ reactions a single $l_n = 0$ transition is found which seems to exhaust most of the $T_<$ spectroscopic strength. The $^{52,53,54}Cr(p,t)$ experiments along with the $^{53}Cr(p,d)$ work indicates that the 2.648 Mev 0^+ level in ^{52}Cr is based upon the neutron configuration $\{(f^{-2}_{\frac{7}{2}})^0\ (2p^2_{\frac{3}{2}})^0\}^0$. The $^{40}Ar(p,t)$ experiment unambiguously assigns the 3.383 Mev level in ^{38}Ar a spin 0^+ on the basis of its L = 0 angular distribution. The results of the $^{54}Cr(p,d)$ and $^{53}Cr(p,p')$ experiments are used in conjunction with the weak coupling model and the models of Maxwell and Parkinson, and Ramavataram to discuss the structure of the low lying levels of ^{53}Cr. An attempt was made to compare the results of this work with the results of other reaction studies whenever possible. (auth)

46597 (RLO-1388-14) PROTON SPIN-FLIP IN INELASTIC SCATTERING LEADING TO FIRST EXCITED STATES NICKEL ISOTOPES. Schmidt, F. H.; Kolasinski, Wojciech A.; Cramer, J. G. (Washington Univ., Seattle). Sept. 1966. Contract AT(45-1)-1388. 4p. (CONF-660811-2). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From American Physical Society Meeting, Mexico City, N. Mex.

Proton inelastic scattering from ^{12}C, ^{58}Ni, ^{60}Ni, and ^{64}Ni was studied by measuring the de-excitation gamma radiation along the axis perpendicular to the scattering plane. According to theory, only gamma radiation arising from ±1 states lies along that axis, and these states can be excited only by proton spin flip. Measurement of inelastically scattered protons in coincidence with perpendicular gamma radiation was used as a measure of proton spin flip. (S.F.L.)

46598 (RPI-328-68) LINEAR ACCELERATOR PROJECT ANNUAL TECHNICAL REPORT DURING FY 1966. (Rensselaer Polytechnic Inst., Troy, N. Y.). Contract AT(30-3)-328. 199p. Dep. mn. CFSTI $5.00 cy, $1.25 mn.

Separate abstracts were prepared for the four main sections of the report. The remaining section deals with the effects of electrons of Ge and Si and the measurement of thermal-neutron cross sections of ^{167}Fr and ^{147}Sm using mass spectrometry. (D.C.W.)

For abstracts of individual sections see: 46561–46563 and 46599.

46599 (RPI-328-68, pp 1-62) NEUTRON CROSS SECTIONS. (Rensselaer Polytechnic Inst., Troy, N. Y.).

Resonance parameter analysis of the tungsten isotopes ^{182}W, ^{183}W, ^{184}W, and ^{186}W was completed for the energy range from 4 ev to 2 kev. Capture cross section measurements from 4 ev to 1 Mev were made on 14 elements from F to Cu including many samples of Na, Fe, Ni and Al, as well as for Pb and Hf isotopes. These data indicate that further gains in signal to background are possible in the hundreds of kev region. Capture and fission cross sections for ^{235}U were measured up to 1 Kev using a 1.25-m detector and a fission chamber. Preliminary data for the fission and capture cross sections of ^{233}U were obtained in the same energy range using a multi-section fission chamber with a fast amplifier for each section. Transmission measurements of ^{240}Pu from about 15 ev to the kev region were performed at 28 m using the Stored Program Data Recorder (SPDR) and the automatic sample changer system. A magnetic tape system to be added to the SPDR will increase the storage capacity so that up to 8 different samples may be cycled in rapid sequence. The capture gamma-ray spectra

of several Hg resonances were measured using a Li–Ge crystal. The SPDR was used to select the various time-of-flight intervals corresponding to the resonances. (auth)

46600 (UCD-CNL-51) A QUASI SHELL MODEL CALCULATION OF ^{16}O. Philpott, R. J.; Szydlik, P. P. (California Univ., Davis. Dept. of Physics). July 22, 1966. Contract AT-11-1-GEN-10. 11p. (CONF-660906-20). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Nuclear Physics, Gatlinburg, Tenn.

The even-parity spectrum of ^{16}O was calculated using the $(0 + 2)\ \hbar\omega$ shell-model functions as a basis. RPA techniques were employed to decouple the core state without eliminating ground-state correlations. By suitably choosing the strength of the interaction, the observed spectrum can be fitted remarkably well. Work is in progress to obtain transition rates and other nuclear properties. (auth)

46601 (UCRL-2426(Vol.2)(1966 Rev.)) HIGH-ENERGY PARTICLE DATA. VOLUME II. RANGE-ENERGY AND dE/dx PLOTS OF CHARGED PARTICLES IN MATTER. Trower, W. Peter (Lawrence Radiation Lab., Univ. of California, Berkeley). July 1, 1966. Contract W-7405-eng-48. 109p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Range-energy and dE/dx graphs are plotted for various incident particles (alpha particles, electrons, muons, pions, kaons, hyperons, protons, and deuterons) in aluminum, argon, beryllium, carbon, copper, emulsion, helium, hydrogen, lead, lithium, nitrogen, oxygen, and silver. Included also is a section of supplemental data which contains information such as photon-mass absorption coefficient curves, and particle ranges in the liquid hydrogen bubble chamber. (B.G.D.)

46602 (UCRL-14942) INVESTIGATION OF THRESHOLD PHOTONEUTRON CROSS SECTIONS FOR IRON AND BISMUTH. Bowman, C. D.; Sidhu, G. S.; Berman, B. L. (Lawrence Radiation Lab., Univ. of California, Livermore). June 30, 1966. Contract W-7405-eng-48. 14p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Photoneutron cross sections were measured for iron and bismuth for photon energies up to 15 kev above threshold by the neutron time-of-flight technique. A number of nuclear levels were observed. Nuclear properties derived from the data include ground-state γ-ray transition widths, γ-ray strength functions, and average level spacings. (auth)

46603 (UCRL-16798) A STUDY OF THE INTERNAL CONVERSION ELECTRONS EMITTED WITHIN THREE NANOSECONDS AFTER THE SPONTANEOUS FISSION OF ^{252}Cf. Watson, Rand Lewis (Lawrence Radiation Lab., Univ. of California, Berkeley). July 1966. Contract W-7405-eng-48. 196p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

Thesis.

The spectra of internal conversion electrons of energies between 10 and 650 kev emitted in coincidence with the spontaneous fission of ^{252}Cf were measured and were correlated to fragments of specific masses. A magnetic steering device was used to guide the electrons to a lithium-drifted silicon electron detector shielded against interference from fission fragments, alpha particles, gamma rays, and x rays. This device also made possible the measurement of the electron spectra in the specific time intervals of approximately 0 to 0.9, 0.1 to 1.7, and 1.1 to 2.9 nsec after fission. The measured spectra showed well-defined structure and were analyzed by means of a least-squares peak-fitting procedure. Many of the lines were identified as K and L conversion line pairs, thus facilitating multipolarity assignments on the basis of K/L ratios. Estimates of intensities and half lives are also given for a large number of the electron lines. By correlating the electron spectra with the gamma measurements of Bowman, it was possible to assign many of the electron lines to specific isotopes. Several of the analyzed electron peaks were suggested to be specific examples of possible 2+ to 0+ transitions in even-even nuclides. Two transitions thought to be associated with ^{110}Ru displayed energies and multipolarities that strongly suggest a region of stable deformation near mass 110. Binding energy calculations were carried out employing a non-relativistic Hartree-Fock computer program developed by Roothaan. The K and L binding energies of Sr, Pd, Xe, and Sm were calculated as a function of ionic charge ranging from the neutral atom to the fully ionized ion. It was found that the K and L binding energies are both increased over the neutral atomic values by approximately 0.9 kev for the most probable ionic charges of the fission fragments, and consequently that the K x-ray energies are almost unaffected. (auth)

46604 (UCRL-16986) GAMMA-VIBRATIONAL BANDS IN ^{182}Os AND ^{184}Os. Yamazaki, T.; Hendrie, D. L. (Lawrence Radiation Lab., Univ. of California, Berkeley). July 1966. Contract W-7405-eng-48. 9p. (CONF-660906-23). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From International Conference on Nuclear Physics, Gatlinburg, Tenn.

The systematics of the gamma-vibrational bands in even Os nuclei (A = 182 to 192) have been obtained from the study of gamma rays from the reactions $^{185}Re(p,2n)^{184}Os$, $^{187}Re(p,2n)^{186}Os$, $^{185}Re(p,4n)^{182}Os$, and $^{187}Re(p,4n)^{184}Os$. The gamma-vibrational energies obtained were 892 kev in ^{182}Os and 942 kev in ^{184}Os. These results reveal a unique correlation of $\hbar\omega_\gamma$ with the moment of inertia. (auth)

46605 (UCRL-16998) NUCLEAR SPINS OF (45 MIN) ^{125}Cs AND (13 DAY) ^{136}Cs; HYPERFINE-STRUCTURE SEPARATIONS AND NUCLEAR MAGNETIC MOMENTS OF ^{125}Cs, ^{136}Cs, AND (6.2 HR) ^{127}Cs. Dabbousi, Osama Bashir (Lawrence Radiation Lab., Univ. of California, Berkeley). July 19, 1966. Contract W-7405-eng-48. 105p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Thesis.

The nuclear spins and hyperfine-structure separations of 45-min ^{125}Cs and 13-day ^{136}Cs were measured. A more accurate value for the hyperfine-structure separation of 6.2-hr ^{127}Cs was obtained by a least-squares fit of the previously observed resonances and the resonances observed. The nuclear-magnetic moments of these isotopes were calculated from the hyperfine-structure separation with the use of the Fermi-Segrè formula. The isotopes ^{125}Cs and ^{127}Cs were obtained by the reactions $^{127}I(\alpha,6n)^{125}Cs$ and $^{127}I(\alpha,4n)^{127}Cs$ on iodine. Barium iodide was also used as a target material in the early runs. Iodine or the barium iodide were separated out chemically after bombardment. Plots of the ratios of the activities obtained by bombarding iodine with α particles are given for the α-particle energy range from 63 to 118 Mev. The isotope ^{136}Cs was produced by the reactions $^{136}Xe(d,2n)^{136}Cs$ and $^{136}Xe(p,n)^{136}Cs$ on xenon gas with natural isotopic abundance. The activities collected on the buttons during a run were normalized by one of two methods: a hot wire monitored the resonance of the stable Cs carrier, and a side button collected the nonresonance atoms. Both procedures give a relative integrated flux of the beam from the oven during the exposure of a button. Explanation of the nuclear spins and magnetic moments of the cesium isotopes studied is attempted in the light of present nuclear theories. A brief survey of the nuclear shell model, its extension to deformed nuclei, and the use of pairing plus quadrupole forces for the interaction between the nucleons in the framework of superconductivity theory is given. The theory of the experiment, experimental procedure, modification of the apparatus, targets used for the production of the isotopes, and chemical separation of the isotopes are also discussed. (auth)

46606 (USNRDL-TR-1033) BETA SPECTRA. I. FORTRAN PROGRAM FOR COMPOSITE SPECTRA. Hogan, O. L.; Hogan, M. A. (Naval Radiological Defense Lab., San Francisco, Calif.). Mar. 28, 1966. Contract AT(49-5)-2505. 85p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

A FORTRAN II program for the IBM 704, which was

written to compute the beta spectra of fission-product mixtures is described. The computation for individual fission products is based on the Fermi theory of beta decay, with a correction for unique first-forbidden transitions. Output is produced as printed tables. Input data, from which spectra of the individual nuclides may be calculated, are tabulated. (auth)

46607 (ZFK-PHA-19) EXPERIMENTELLE PROBLEME BEI DER MESSUNG VON NANOSEKUNDEN-LEBENSDAUERN ANGEREGTER KERNNIVEAUS. (Experimental Problems in the Measurement of Nanosecond Lifetimes of Excited Nuclear Levels). Stary, Franz; Meiling, Wolfgang (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (East Germany)). Feb. 1966. 18p. Dep. mn.

The different methods of analyzing delayed coincidence curves for the determination of nanosecond lifetimes of excited nuclear levels are discussed with regard to their errors. In consequence of the insufficient knowledge of the prompt coincidence curve and the background, the numerical solution of the convolution integral using computers can not be performed in all cases. A multichannel time analyzer is described in which the time-to-pulse-height converter acts on the overlap principle. Background effects disturbing the lifetime measurements particularly were investigated by means of the apparatus described and a light-pulse generator. (auth)

46608 (ZFK-PHA-21) UEBER DEN EINFLUSS VON PAARKORRELATIONEN AUF E1-UEBERGAENGE IN UNGERADEN DEFORMIERTEN KERNEN IM GEBIET DER SELTENEN ERDEN. (On the Influence of Pairing Correlations on E1 Transitions in Odd Deformed Nuclei in the Region of the Rare Earths). Meiling, Wolfgang; Stary, Franz (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (East Germany)). Feb. 1966. 28p. Dep. mn.

A survey was made of the calculation of single-particle transition probabilities according to the Nilsson model, and theoretical transition probabilities were compared with experimental values of E1 transitions in deformed odd-A nuclei of the rare-earth region. It can be shown that the agreement between theoretical E1 transition probabilities using the Nilsson model and experimental data is not improved by considering pairing correlations. Because of the great inaccuracy of the calculated pairing correction factor R_γ, no systematic differences in the theoretical transition probabilities compared to the experimental values can be recognized. (auth)

46609 (ZFK-TPH-20) FORMALE STREUTHEORIE. (Formal Scattering Theory). Pfitzner, Alfred (Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (East Germany)). Jan. 1966. 47p. (In German). Dep. mn.

Seminar Lecture Delivered in the Field of Theoretical Physics.

Seminar lectures on an introduction to formal scattering theory are presented, and the formal theory is expanded to nuclear reactions. The most simple applications of the expanded theory to deuteron pickup and rearrangement effect is illustrated. (J.S.R.)

46610 (ANL-Trans-353) SHELL CORRECTIONS FOR THE CLASSICAL NUCLEAR ENERGY MODEL. Strutinskii, V. M. (Institut Atomnoi Energii, Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow). Translated by Elmar K. Wilip (Argonne National Lab., Ill.), from report IAE-1108. 37p. Dep. mn. CFSTI $2.00 cy, $0.50 mn. JCL $3.60 fs, $1.37 mf.

A correction was calculated for the classical liquid-drop nuclear energy model connected with the quantum inhomogeneity on nucleon distribution in the phase space (by shells). The dependence of the nuclear energy on the deformation was calculated, as well as the equilibrium deformations of the nuclei and the shell corrections for the masses of ground states and for the nuclear fission thresholds. The Nilsson level scheme was used in the calculations and the pairing of nucleons has been considered. It was shown that there exists a direct correlation between the shell correction and the energy and density of nucleonic levels near the Fermi energy. During the deformation there occurs a translocation of heavy shells, resulting in the appearance of periodical level condensations and rarefactions near the Fermi energy. In the deformed nuclei which correspond to the center of the shell, secondary shells are formed (N ~ 100, 152, etc.) which stabilize the nuclei in the deformed state and which determine the stability of superheavy nuclei against fission. The secondary shells in the so-called spherical nuclei which are close to Pb lead to an energy minimum together with a considerable deformation which can be connected with strongly excited quasi-equilibrium states. Tentative calculation results are described for high deformations of very heavy nuclei. Periodic rarefactions and condensations of levels occur even at high deformations which can lead to essential deviations from the conventional fission pattern of superheavy nuclei. (auth)

46611 (LA-tr-66-46) ANGULAR ANISOTROPY OF PHOTOFISSION AND PARITY OF GROUND STATE OF ^{239}Pu. Kapitsa, S. P.; Tsipeniuk, Iu. M. (Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Obninsk, Fiziko-Energeticheskii Institut). Translated by A. D. Cernicek (Los Alamos Scientific Lab., N. Mex.), from report FEI-12. 14p. Dep. mn. CFSTI $1.00 cy, $0.50 mn. JCL $1.60 fs, $0.80 mf.

Angular distributions of fragments in the photofission of ^{239}Pu by quanta braking radiation from a microtron of the limiting energy interval E_{max} = 5.4 to 7.9 Mev were measured. Anisotropic angular distributions of the $W(\vartheta) = a + b \sin^2 \vartheta$ type were observed with E_{max} = 5.4, 5.65, and 5.9 Mev. Maximum anisotropy complying with b/a = 0.192 was recorded with E_{max} = 5.65 Mev. A comparison of the results with the data on the fission of ^{238}Pu induced by neutrons allows a parity of the ground state of ^{239}Pu to be determined as against the parity of the ground states of an even-even nucleus. The data on fission are in accord with the positive parity of ^{239}Pu resulting from spectroscopic data. (auth)

46612 QUANTUM THEORY OF ANGULAR DISTRIBUTIONS FOR REACTIONS AND CASCADES. Hittmair, O.; Kasperkovitz, P. Acta Phys. Austr., 22: 107-48(1966). (In German).

The theory of angular distribution was formulated on the general quantum theory principles in logical development so that new formulations are obtained for cascades. After consequent application of the projector concept to the description of the system state, the angular distribution was calculated as it is given from the rotation invariants. No relation was made to the type of radiation, the explicit form of the transition matrix, or other invariant properties other than the opposite rotation. After simplifications by suitable selection of the quantization axis and introduction of Racah coefficients, the elastic scattering was calculated as an example. The effects of the shell-model coupling on the angular distribution of nuclear reactions and the special problem of γ radiation, especially in γ cascades, were considered. A new type of state description was proposed which protects the conservation of particles and permits a formulation in reaction form. (tr-auth)

46613 YIELDS FROM NUCLEAR REACTIONS PRODUCING ^{54}Mn IN CYCLOTRONS. Krasnov, N. N.; Dmitriev, P. P. At. Energ. (USSR), 21: 52-3(July 1966). (In Russian).

Data are presented on ten processes producing ^{54}Mn in a 1.5-m cyclotron using 10-mm disc targets. The reactions used were ^{52}Cr(α,pn), ^{53}Cr(α,p2n), ^{53}Cr(d,n), ^{54}Cr(p,n), ^{54}Cr(d,2n), ^{54}Fe(d,2p), ^{56}Fe(d,α), ^{57}Fe(d,αn), ^{55}Mn(p,pn), and ^{51}V(α,n). The yield of ^{54}Mn was plotted as a function of particle energy. The highest yield of ^{54}Mn was obtained with the ^{55}Mn target; however, the product was not carrier-free in this case. The additional nine reactions produced carrier-free product with the highest yield coming from the α irradiation of chromium. (R.V.J.)

46614 INVESTIGATION OF NUCLEAR REACTIONS WITH 14 Mev NEUTRONS. Csikai, J. At. Kozlem., 8: 79-86(June 1966).

Cross sections were determined for the reaction (n,p) at E_n = 14.7 Mev for the target nuclei ^{14}N, ^{19}F, ^{23}Na, ^{27}Al, ^{42}Ca, ^{43}Ca, ^{44}Ca, ^{45}Sc, ^{89}Y, ^{139}La, ^{188}Os, and ^{190}Os. Cross sections for the reaction (n,2n) were measured at 3 Mev above threshold for the nuclei ^{45}Sc, ^{48}Ca, ^{55}Mn, ^{58}Ni, ^{63}Cu, ^{65}Cu, ^{64}Zn, ^{70}Zn, ^{82}Se, ^{85}Rb, ^{87}Rb, ^{86}Sr, ^{89}Y, ^{90}Zr, ^{92}Mo, and ^{144}Sm. Neutron capture cross sections for E_n = 14.7 Mev were measured for ^{23}Na, ^{27}Al, ^{30}Si, ^{45}Sc, ^{48}Ca, ^{50}Ti, ^{51}V, ^{55}Mn, ^{89}Y, ^{103}Rh, ^{123}Sb, ^{139}La, ^{208}Pb, and ^{209}Bi. Excitation functions for the reaction (n,2n) were determined for the nuclei ^{14}N, ^{19}F, ^{58}Ni, ^{63}Cu, ^{65}Cu, ^{92}Mo, ^{107}Ag, and ^{181}Ta in the energy range $13.56 \leq E_n \leq 14.7$ Mev with an average energy resolution of $\Delta E_n \approx 50$ kev. The ratio of the forward to backward yield of the recoil nuclei in the (n,α) reaction was investigated for target nuclei ^{27}Al, ^{45}Sc, ^{59}Co, ^{103}Rh, ^{115}In, and ^{181}Ta. Also obtained were cross sections for the reaction (n,α) on ^{7}Li and ^{103}Rh for E_n = 14.7 Mev. (S.F.L.)

46615 THE DETERMINATION OF THE COEFFICIENT OF INTERNAL PAIR PRODUCTION OF ^{60}Co COMPLETING THE EXAMINATION OF POSITRON DECAY OF ^{143}Pm, ^{144}Pm, AND ^{146}Pm ISOTOPES. Varga, Dezso. At. Kozlem., 8: 87-91(June 1966). (In Hungarian).

The internal pair production coefficient of ^{60}Co was corrected for errors arising from external pair production in an absorbing material. The results were applied to measurements of positron decay of ^{143}Pm, ^{144}Pm, and ^{146}Pm in which ^{60}Co was used as a control. (S.F.L.)

46616 THE ANGULAR DISTRIBUTION OF ALPHA PARTICLES IN $^{20}Ne(n,\alpha)^{17}O$ REACTIONS AT 14.5 Mev. Bornemisza-Pauspertl, P. At. Kozlem., 8: 93-5(June (1966).

The reaction $^{20}Ne(n,\alpha)^{17}O$ was investigated at E_n = 14.5 Mev using cloud-chamber photography. The α-particle angular distribution curve exhibits a peak at 90°, indicating that the dependence of the range of the emitted particles on the angular momentum can not be neglected for this reaction. (S.F.L.)

46617 DOSE CONSTANTS OF GAMMA-RAYS. Marth, W. (Gesellschaft fuer Kernforschung mbH, Karlsruhe, Ger.). Atompraxis, 12: 392-8(Aug. 1966). (In German).

The partial and total dose constants are given for a number of important nuclides generated by reactor activation. (auth)

46618 SOME ASPECTS OF LOW ENERGY NUCLEAR PHYSICS. de Hemptinne, Marc. Bull. Cl. Sci., Acad. Roy. Belg. (5), 51: 1482-1504(1965). (In French).

Three techniques that can be used in the study of nuclear structure are discussed with a consideration of the advantages and disadvantages of each. The three techniques discussed are electromagnetic γ spectroscopy, study of β emission, and study of the nuclear reactions between nuclei and accelerated particles with an energy of the order of several kev up to several tens of Mev. (J.S.R.)

46619 RELATIVE ISOTOPIC DISPLACEMENT OF ISOTOPES 238, 235, AND 233 OF URANIUM AND INTRINSIC QUADRUPOLE MOMENTS OF ISOTOPES 238 AND 236. Gagne, Jean-Marie (Ecole Polytechnique, Montreal). Can. J. Phys., 44: 423-9(Feb. 1966). (In French).

Using a Fabry-Perot photoelectric spectrometer and a very precise method of standardizing the recorded spectra, the relative isotopic shifts $(^{238}U-^{233}U)/(^{238}U-^{235}U)$ of 20 arc-spectrum lines belonging to three different types of transition, f^3ds^2-f^2dsp, f^3d^2s-f^3dsp, f^3ds^2-f^3s^2p, were measured. The relative isotopic shift of all these arc-spectrum lines is the same within the experimental error (1%) as that of the spark-spectrum line $\lambda = 4244\text{Å}$ (f^3s^2-f^2dp). The particularly favorable line $\lambda = 5027\text{Å}$ (because of absence of hyperfine structure) gives the value 1.555 ± 0.001 for the relative isotopic shift $(^{238}U-^{233}U)/(^{238}U-^{235}U)$. The measured relative isotopic shift being constant, this value was used to calculate the intrinsic quadrupole moments of ^{238}U and ^{236}U ($^{238}Q_0 = 6.9 \times 10^{-24}$ cm^2 and $^{236}Q_0 = 8.0 \times 10^{-24}$ cm^2). (auth)

46620 CONVERSION ELECTRONS FROM THE 25.6-kev E1 TRANSITION OF ^{231}Pa. Cardona, Jean; Gizon. Andree (Faculte des Sciences, Grenoble, France. CEN, Grenoble, France). Compt. Rend., Ser. B, 263: 402-5 (Aug. 1, 1966). (In French).

A normal E1 multipolarity was attributed to the 25.6-kev transition of ^{231}Pa on the basis of an analysis of the L and M conversion-electron groups. (D.C.W.)

46621 EXCITED LEVELS OF ^{167}Tm OBTAINED FROM THE DECAY OF ^{167}Yb. Paris, Pierre (CNRS, Orsay, France). Compt. Rend., Ser. B, 263: 406-9(Aug. 1, 1966). (In French).

The experimental study of the decay $^{167}Yb \rightarrow {}^{167}Tm$ confirmed the previously accepted levels of ^{167}Tm and also showed seven previously unreported transitions at 142, 194, 283, 291, 923, 1119, and 1233 kev. The 142-kev line, which has an E1 multipolarity, affords evidence for the existence of another intrinsic level at 322 kev. A level diagram including these new transitions is proposed. (tr-auth)

46622 ON THE 3^+ LEVEL IN ^{186}Os POPULATED IN ^{186}Re β-DECAY. Maly, L.; Vejs, M. (Nuclear Research Inst., Czechslovak Academy of Sciences, Rez, Czech.). Czech. J. Phys., 16: 763-6(1966).

The coincidences of the 400 to 1100 kev gammas with the conversion electrons of the 137-kev transition were measured with the intermediate image spectrometer modified for β-γ coincidences. The e_L 137-γ 770 kev coincidences were observed. Consequently, in addition to the known 768-kev transition, there is another one with closed energy. For this transition the relative intensity ratio $I_\gamma^{632}/I_\gamma^{773} = 8 \pm 2$ was determined. The corrected decay scheme of ^{186}Re is presented. (auth)

46623 ON THE β^+ DECAY OF NEUTRON DEFICIENT ISOTOPES. Goldanskii, V. I. (Inst. of Chemical Physics, Academy of Sciences, USSR). Dokl. Akad. Nauk SSSR, 167: 549-52(Mar. 21, 1966). (In Russian).

If information is available on mirror nuclei with a neutron excess or on various isotopic states of other nuclei which are a part of a given isotopic multiplet, it is possible to obtain an accurate estimate of the nucleon binding energy and of the mass defect for neutron-deficient nuclei. The binding energy of the Zth proton B_p in a neutron-deficient nucleus (Z > N) can be accurately related to the binding energy of the Zth neutron B_n in the mirror neutron-excess nucleus through the difference in binding energies of the neutron and proton in the isotopically self-conjugated nucleus containing Z neutrons and Z protons. The energy of positron decay Q_+ is related to the difference in coulombic energies ΔE_{coul} of the initial and final nuclei as follows: at $Z > N + 1$, $Q_+ > \Delta E_{coul} - 0.78$ Mev; at $Z = N + 1$, $Q_+ = \Delta E_{coul} - 0.78$ Mev; and at $Z < N + 1$, $Q_+ < \Delta E_{coul} - 0.78$ Mev. The difference $\Delta E_{coul} - 0.78$ Mev $= \Delta E_{coul} - (m_n - m_p)C^2 = Q_+$ ($\Delta T = 0$) is the energy of superallowed positron decay with no change in isotopic spin ($\Delta T = 0$). Values of Q_+ are plotted as a function of Z, and regions with $Z > N + 1$ and $Z < N + 1$ are distinguished. A superallowed positron decay with a short half life is possible for all nuclei with $Z > N + 1$. These energy values for positron decay are based on the principle of isotopic invariance and are more accurate than tabulated values which are often erroneous. These data can be useful in predicting the occurrence of positron-emitting isotopes. (TTT)

46624 ^{115}Pd YIELD IN THERMAL NEUTRON FISSION OF ^{235}U. Weiss, H. V.; Reichert, W. L. (Naval Radiological Defense Lab., San Francisco). J. Inorg. Nucl. Chem., 28: 2067-70(Oct. 1966).

The formation of ^{115}Pd in thermal neutron fission of ^{235}U was studied quantitatively. A procedure was developed, which rapidly separated palladium from daughter elements silver and cadmium. Separations were made from 2.8 to 120 sec after fission. The growth of ^{115}Cd from palladium separated at various times constituted a decay curve for ^{115}Pd. The half life thus determined was 40.5^{+4}_{-3} sec, a value that agrees with those previously reported. The cumulative fractional yield of ^{115}Pd compared to the total ^{115}Cd yield was 90.5 ± 7.2%. Estimation of the most probable nuclear charge (Z_p) must await information on the contribution of other members to the yield of the 115 mass chain. (auth)

46625 MASS DISTRIBUTION IN THE FISSION OF ^{232}Th BY 14.8-Mev NEUTRONS. Ganapathy, R.; Kuroda, P. K. (Univ. of Arkansas, Fayetteville). Contract AT(40-1)-3235. J. Inorg. Nucl. Chem., 28: 2071-4(Oct. 1966).

Radiochemical measurements were made of the fission yields of eight mass chains, mostly in the symmetric region, from the fission of ^{232}Th induced by 14.8-Mev neutrons. The mass distribution in the symmetric valley region indicated the presence of a third peak in the mass-yield curve. (auth)

46626 REACTIONS BETWEEN 14.7-Mev NEUTRONS AND ^{64}Ni. Strain, J. E.; Ross, W. J. (Oak Ridge National Lab., Tenn.). J. Inorg. Nucl. Chem., 28: 2075-80 (Oct. 1966).

The reaction products of ^{64}Ni and 14.7-Mev neutrons were examined experimentally with a 150-kv Cockcroft-Walton accelerator. Mass assignments are made on the basis of ^{64}Ni(n,p)^{64}Co and ^{64}Ni(n,α)^{61}Fe reactions. The ^{61}Co daughter of ^{61}Fe was observed, but no evidence was found for nuclides currently ascribed to the reaction: ^{64}Ni(n,np)^{63}Co, ^{64}Ni(n,p)^{64m}Co, or ^{64}Ni(n,p)^{64g}Co. (auth)

46627 WESTCOTT'S s_0 FOR THE REACTION ^{109}Ag(n,γ)^{110m}Ag. Cabell, M. J.; Wilkins, M. (Atomic Energy Research Establishment, Harwell, Eng.). J. Inorg. Nucl. Chem., 28: 2405-7(Oct. 1966).

Westcott's s_0 for the reaction ^{109}Ag(n,γ)^{110m}Ag was measured using small neutron doses to the gold monitors during irradiation so that corrections were not necessary for the destruction of ^{198}Au by neutron capture. Gold–aluminum alloy and silver–aluminum alloy wires were irradiated in pairs, a gold and silver monitor to each pair. Each complete measurement consisted of two irradiations. In the first the two monitors were unshielded; in the second they were contained within a cadmium box. The s_0 for the reaction ^{109}Ag(n,γ)^{110m}Ag was equal to 18.53 ± 0.69. (D.H.M.)

46628 HALF-LIVES OF SOME EUROPIUM AND GADOLINIUM NUCLIDES. Daniels, W. R.; Hoffman, D. C. (Los Alamos Scientific Lab., N. Mex.). J. Inorg. Nucl. Chem., 28: 2424-7(Oct. 1966). (LA-DC-7782).

The half lives of ^{156}Eu, ^{157}Eu, ^{158}Eu, ^{159}Eu, and ^{159}Gd were redetermined. Attempts to determine the half lives of ^{157}Sm and ^{158}Sm by a radiochemical milking technique were unsuccessful, but an upper limit of 15 min was established for each of these half lives. The nuclides were prepared by 14-Mev deuteron and ~25-Mev bremsstrahlung bombardment of separated gadolinium targets and by thermal-neutron fission of ^{235}U or 25-Mev alpha fission of ^{238}U. The decay was followed by propane flow β-proportional counters. (M.C.G.)

46629 HALF LIFE OF ^{137m}Ba. Marais, P. G.; Haasbroek, F. J.; van der S. Lotz, E.; van R. Smit, J. (Fruit and Food Tech. Research Inst., Stellenbosch, S. Afr.). J. S. Afr. Chem. Inst., 19: 1-5(Apr. 1966).

An accurate value for the half life of ^{137m}Ba was sought since the only published values, 158 ± 5 and 156 ± 3 sec are too inaccurate. ^{137m}Ba was obtained by elution from a small column of the cation-exchanger ammonium 12-molybdophosphate (AMP) onto which the contaminant ^{137}Ca had been absorbed. AMP was used as it exhibits unique selectivity for cesium in acid solution. Decay of ^{137m}Ba was followed in a well-type scintillation counter with a resolving time of 2.2 μsec as determined with the two-source method. Because of the relatively short half life of ^{137m}Ba, counting periods (Δt) had to be chosen carefully to avoid complications caused by radioactive decay of the sample during Δt. The decay of samples of ^{137m}Ba was followed by measuring the counting rates at various intervals, starting in each case when the counting rate was 2×10^6 cpm. Linear regressions of the logarithms of the true instantaneous counting rate at the middle Δt ($\bar{N}_k$) on t, as well as the standard errors of the regression coefficient b, were calculated. Using these regression coefficients, the half life ($T_{\frac{1}{2}}$) was calculated from the relation $T_{\frac{1}{2}} = (\log_{10}2)b$. The limits of error of the half lives were found by using the limiting values of b obtained in the regression equations. The reproducibility of the results was excellent. As expected, the half life calculated from the data using only the half-life period was the least accurate because of the smaller number of points and relatively short decay period. The mean half life calculated from these results is similar to that obtained from readings covering 3 half-life periods. The effect of resolving time corrections was greatest for those readings obtained during the first half-life period. The fact that a similar half life was obtained indicated that the slope of the decay curve remained constant throughout the measurements. Using the data obtained with the 15 evenly spaced points, the standard error decreased considerably despite the fact that the total number of points only increased from 13 to 15. This is due to the fact that the decay period covered by these 15 points was three instead of only one half-life period. The standard error decreased further when all 26 decay points were considered. These points gave a half-life value of 153.08 ± 0.04 sec, in close agreement with that of 153.24 ± 0.18 sec obtained by Merritt and Taylor. (BBB)

46630 TANIFUJI-BUTLER MODEL FOR DEUTERON STRIPPING REACTIONS. Pearson, C. A. (Australian Atomic Energy Commission, Lucas Heights. Neils Bohr Inst., Copenhagen); Bang, J. M. Nature, 211: 577-8 (Aug. 6, 1966).

It is shown that the sudden-approximation model can not be used for the (d,p) stripping reaction, since it contains no mechanism by which the neutron can propagate into the bound final state. (D.C.W.)

46631 INDEPENDENT FISSION-FIELDS OF ^{134}Cs. Anderson, I. Oe.; Brune, D. (Aktiebolaget Atomenergi, Studsvik, Sweden). Nature, 211: 618-19(Aug. 6, 1966).

An attempt was made to determine the magnitude of the possible direct-fission yield of ^{134}Cs in thermal-neutron fission of ^{235}U. It was concluded that direct formation can be ruled out as a possible explanation of the occurrence of ^{134}Cs in fallout. (D.C.W.)

46632 LIQUID DROP MODEL AND ASYMMETRIC NUCLEAR FISSION. Morris, S. P.; Sharma, R. C. (Sir George Williams Univ., Montreal). Nature, 211: 624-5 (Aug. 6, 1966).

The interpretation of the asymmetry of fission in terms of the division of electrically charged liquid drops is briefly discussed. (D.C.W.)

46633 ABSENCE OF SPECIES OTHER THAN ^{87}Br CONTRIBUTING TO THE 55.4-SEC DELAYED NEUTRON ACTIVITY IN FISSION. Williams, Evan T.; Coryell, Charles D. (Massachusetts Inst. of Tech., Cambridge). Nucl. Appl., 2: 256-8(June 1966). (MIT-905-45).

Two experiments showed that ^{87}Br is the major contributor to the 55-sec delayed-neutron activity in ^{235}U thermal-neutron fission products. An upper limit of 0.5% was set on the possible contribution to the total 55-sec delayed-neutron activity by unknown precursors with half life of the order of 55-sec or longer. The half life of ^{87}Br was accurately measured by observing the neutron decay in chemically pure bromine samples and was found to be 55.4 ± 0.7 sec. (auth)

46634 RECENT REFERENCES [ON NUCLEAR DATA]. Nucl. Data, Sect. B, 1: No. 3, B1.3.1-151(July 1966).

A compilation of recent additions to the information on nuclear decay, properties, reactions, and scattering is presented. All the available journal publications of 1965 are covered. 1450 references. (D.C.W.)

46635 NEUTRON SINGLE-PARTICLE ENERGIES IN THE Yb ISOTOPES. Chasman, R. R. (Argonne National Lab., Ill. Royal Inst. of Tech., Stockholm. Research Inst. for Atomic Physics, Stockholm). Nucl. Phys., 89: 11-21(1966).

Excitation energies of seniority-one states in the odd-mass Yb isotopes are calculated in the framework of the pairing force theory. A neutron single-particle energy

level spectrum is deduced by comparing calculated and observed excitation energies. Pairing factors for electromagnetic transitions are calculated for a system of equally spaced levels representative of the Yb isotopes. (auth)

46636 REACTIONS INDUCED BY PROTON BOMBARDMENT OF ALUMINIUM. Mehta, M. K.; John, Joseph; Kerekatte, S. S.; Divatia, A. S. (Atomic Energy Establishment, Trombay, India). Nucl. Phys., 89: 22-32 (1966).

The excitation functions of the reactions $^{27}Al(p,p_0)^{27}Al$, $^{27}Al(p,p_3)^{27}Al^*$ and $^{27}Al(p,\alpha)^{24}Mg$ are measured in the proton energy range $E_p = 3.5 - 5.5$ Mev with an energy resolution of about 5 kev. The differential cross sections are measured with an accuracy of ±15% at lab angles of 90 and 150°. The excitation curves exhibit sharp maxima of 10 to 50 kev width superimposed on a broad 150–200 kev wide structure. A fluctuation analysis of the data in terms of autocorrelations yields a coherence energy varying from 15 ± 3 to 22 ± 3 kev depending upon the excitation functions and the averaging interval chosen. Non-zero cross correlations between the two α_0 yield curves and the p_3 yield curve indicate the presence of the correlated resonance structure due to individual or groups of similar levels in the compound nucleus ^{28}Si in the region of excitation from 15.3 to 16.9 Mev. (auth)

46637 LANE'S MODEL AND ITS APPLICATION TO THE ISOBARIC ANALOGUE RESONANCES. Mahaux, C. (Univ. of Liege. Univ., Heidelberg); Weidenmueller, Hans A. Nucl. Phys., 89: 33-62(1966).

The isobaric spin-dependent term of the optical potential as proposed by Lane on a phenomenological basis is derived from a microscopic treatment taking antisymmetrization into account. Lane's equations result from a number of assumptions on the interactions and on the wave function of the scattering system. The validity of these approximations is discussed. Lane's equations are analytically solved in a simple case with cut-off potentials. It is demonstrated that the asymmetry of the peaks in the (p,n) cross sections gives valuable information on the isobaric spin purity of the scattering wave function in the vicinity of the isobaric analogue resonance. It is shown that the shape of the asymmetry and the value of the resonance width may depend sensitively upon the value of the interaction potential U_1. A Green-function analysis of the resonance phenomenon is also developed and is compared with the former treatment. (auth)

46638 THE DOUBLE-STRIPPING REACTION $^{16}O(^3He,n)^{18}Ne$. Krick, Merlyn; Legge, G. J. F. (Univ. of Pennsylvania, Philadelphia). Nucl. Phys., 89: 63-8 (1966).

The angular distributions of two neutron groups from the reaction $^{16}O(^3He,n)^{18}Ne$, at $E(^3He) = 11$ Mev, were investigated with a double scatter time-of-flight spectrometer. The data were analyzed with Newns' plane-wave, double-stripping theory. The transition to the ground state and first excited state were well fitted with L = 0 and 2, respectively. The corresponding peak cross sections are 21 ± 4 and 11 ± 2 mb/sr. The results are compared with those obtained for the mirror reaction $^{16}O(t,p)^{18}O$. (auth)

46639 OPTICAL MODEL ANALYSIS FOR PROTONS AT 180 Mev. Elton, L. R. B. (Univ. of Surrey, London). Nucl. Phys., 89: 69-80(1966).

It is shown that the experimental results for the elastic scattering cross section, polarization, and reaction cross section for 180-Mev protons scattered by nuclei can be interpreted in terms of an optical potential, the real part of which is repulsive in the central region of the nucleus, and that an interpretation in terms of a more orthodox optical potential would be difficult to achieve. The analysis is performed for the nuclide ^{56}Fe. A possible explanation of the result in terms of the behavior of the two-body t-matrix off the energy shell is suggested. (auth)

46640 M1 AND E2 TRANSITION RATES IN ^{125}I AND ^{127}I. Geiger, James S.; Graham, Robert L. (Atomic Energy of Canada Ltd., Chalk River, Ont.). Nucl. Phys., 89: 81-96(1966).

Using mass-separated sources of ^{125}Xe and ^{127}Xe, time correlations were measured between K x-rays and conversion electrons. In some cases an orange β spectrometer was used to select the conversion line of interest. The mean lives for the following levels in ^{125}I are: 113.57 kev, $\tau = 0.87 \pm 0.05$ nsec; 188.43 kev, $\tau = 0.51 \pm 0.01$ nsec; 243.40 kev, $\tau \leq 0.27$ nsec and in ^{127}I, 202.83 kev, $\tau = 0.55 \pm 0.01$ nsec. Utilizing the energies, relative intensities, and multipolarities established from separate high-resolution studies of the internal conversion electron spectra, the absolute rates of three M1 and five E2 transitions are deduced. These are compared with rates of similar transitions in neighboring nuclei and the predictions of the Kisslinger-Sorensen model. (auth)

46641 NUCLEAR OPTICAL-MODEL POTENTIAL. Lipperheide, R. (Hahn-Meitner-Institut fuer Kernforschung, Berlin). Nucl. Phys., 89: 97-126(1966).

The nuclear optical-model potential is investigated from a non-phenomenological standpoint. Its range of application is extended to the region of negative energies for the calculation of bound-state energies and reduced widths. From general arguments and shell-model considerations, a form of the generalized optical-model potential is proposed consisting of an energy-independent term, a sum of factorable terms containing real and complex poles in the energy plane, and a weakly energy-dependent direct term. (auth)

46642 PROPERTIES OF BOUND STATES OF ^{18}O ABOVE THE 4.45-Mev STATE. Lopes, J. S.; Haeusser, O.; Gill, R. D.; Rose, H. J. (Oxford Univ.). Nucl. Phys., 89: 127-44(1966).

The decay modes, spins, and the mixing ratios of some of the de-excitation gamma rays of the ^{18}O states located at 5.09, 5.25, 5.33, 5.37, and 5.52 Mev have been determined by p-γ angular correlation measurements using the $^{18}O(p,p'\gamma)^{18}O$ reaction. The 5.09 Mev level ($J^\pi = 3^-$) decays to the 3.92 Mev (14%), 3.55 Mev (5%), and 1.98 Mev (81%) levels; the mixing ratio of the 5.09 → 1.98 Mev transition is $\delta(5.09 \rightarrow 1.98) = 0 \pm 0.02$. The 5.25 Mev level ($J^\pi = 2^+$) decays to the 1.98 Mev (60%) and to the ground state (40%); $\delta(5.25 \rightarrow 1.98) = 0.2 \pm 0.1$. The 5.33 Mev level ($J^\pi = 0^+$) decays to the 4.45 Mev (27%), 3.92 Mev (10%), and 1.98 Mev (63%) levels. The 5.37 Mev level ($J^\pi = 3^+$) decays to the 3.92 Mev (15%) and 1.98 Mev (85%) levels; $\delta(5.37 \rightarrow 1.98) = 0 \pm 0.05$. The 5.52 Mev level (J = 1, 2; the value $J^\pi = 2^-$ is suggested) decays to the 4.45 Mev (25%), 3.92 Mev (10%), and 1.98 Mev (65%) levels; if J = 2 then $\delta(5.52 \rightarrow 4.45) = 0 \pm 0.04$ and $\delta(5.52 \rightarrow 1.98) = 0 \pm 0.02$. A tentative interpretation of these results in the light of available theoretical calculations is presented. In particular, special reference is made to Harvey's model for the negative parity states and Engeland's core excitation model for the positive parity states. (auth)

46643 CALCULATION OF THE LEAD ISOTOPES USING A REALISTIC RESIDUAL INTERACTION. Clement, David M.; Baranger, Elizabeth U. (Univ. of Pittsburgh). Nucl. Phys., 89: 145-53(1966).

The nonlocal Tabakin potential is used as the residual interaction in a shell-model calculation of ^{206}Pb, in which only configurations consisting of two holes in the closed shell are included. The 0^+ ground state is lowered by only half the experimental amount, although good agreement is obtained for the lowest 2^+, 4^+, and 6^+ states. A quasi-particle (BCS) calculation of the lighter lead isotopes yields an odd-even mass difference which is too small. When additional configuration mixing is included using a "pairing phonon," reasonable agreement is attained with the experimental odd-even mass differences, with the low-energy spectra of the odd isotopes, and with separation energies. These results are very similar to those obtained in the tin isotopes. (auth)

46644 ELASTIC SCATTERING OF 3.2-Mev NEUTRONS FROM MANY ELEMENTS. Becker, R. L.; Guindon, W. G.; Smith, G. J. (Boston Coll., Chestnut Hill, Mass.). Contract AT(30-1)-2641. Nucl. Phys., 89: 154-64(1966). (TID-22296).

The differential cross section for the elastic scattering

of 3.2-Mev neutrons was measured at 12 or more angles for each of 36 elements. Pulse-height discrimination was used to exclude inelastically scattered neutrons. For each element optical model parameters which resulted in the best fit to the shape-elastic contribution of the measured cross sections were obtained. Averages of these parameters over all elements are in good agreement with values obtained by other investigators. However, the measurements are not uniformly consistent with optical-model calculations employing these average parameters. (auth)

46645 MECHANISM OF INELASTIC PROTON SCATTERING ON ^{48}Ti. Hulubei, H.; Berinde, A.; Neamu, I.; Scintei, N.; Martalogu, N. (Inst. for Atomic Physics, Bucharest). Nucl. Phys., 89: 165-76(1966).

The angular distributions and p-γ angular correlations of the inelastically scattered protons on the first ^{48}Ti excited state in the 4.0–8.5 Mev energy range were measured. The coplanar angular correlations for energies smaller than 7 Mev are in good agreement with the statistical model predictions. To obtain the fit with the experimental angular distributions for 5.65 Mev, it was necessary to include the (p,n) channels in the statistical model calculations. The angular correlations at E_p = 7.3 and 8.5 Mev and the angular distribution at E_p = 7.06 Mev make evident the presence of the direct interaction. The non-coplanar angular correlations measured in the bombarding energy range 4.0–8.5 Mev are in reasonable agreement with the statistical model predictions. (auth)

46646 SCATTERING AT LARGE ANGLES BY LIGHT NUCLEI OF STRONGLY ABSORBED PARTICLES. Ceuleneer, R.; Demeur, M.; Reignier, J. (Univ. Libre, Brussels). Nucl. Phys., 89: 177-91(1966). (In French).

Some experimental data are discussed in the framework of a previously proposed model with one single Regge pole. These data show that, as opposed to the forward case, the backward elastic scattering depends critically on the microscopic properties of the projectile and the target nucleus. The model reproduces perfectly the results obtained by Van Oers for $\alpha-^{16}$O; for $\alpha-^{12}$C scattering in the 20–23 Mev region, a normalization factor must be introduced to take care of the considerable amount of absorption in the states which give most of the backward contribution. The physical interpretation of the pole as a temporary rotator with a very short lifetime leads to dimensions compatible with the basic hypotheses of the model. On comparing the one-pole formulas for the spin 0-spin 0 and spin 0-spin $\frac{1}{2}$ cases, a striking qualitative difference is found in the large angle elastic scattering-heavy oscillations in the first case and no oscillations in the second case. Both show, however, a large peak in the extreme backward scattering. The present data for $\alpha-^{31}$P confirm this prediction. A conclusive test would be to compare the backward elastic scattering of ^{4}He and ^{3}He by the same even nucleus at the same energy in the barycentric system. (auth)

46647 DISPERSION CORRECTIONS TO ELECTRON SCATTERING IN ^{12}C AND ^{16}O. Bottino, A. (Ecole Normale Superieure, Orsay, France); Ciocchetti, G.; Molinari, A. Nucl. Phys., 89: 192-208(1966).

Calculations of the dispersion corrections to elastic (^{16}O and ^{12}C) and inelastic (^{12}C) electron scattering are performed in second Born approximation taking as intermediate nuclear levels those most readily excited by electron scattering. Dispersion effects of the order of $1/Z$ are found at the diffraction minima of the form factors and for high energy and large angles. Wave distortions in the inelastic scattering are also briefly discussed. (auth)

46648 LEVELS OF ^{116}In AND THEIR ANALOGUE RESONANCES IN ^{116}Sn. Thompson, J. C.; Talbot, K.; Parry, G. (Univ. of Liverpool). Nucl. Phys., 89: 209-24(1966).

Excitation functions were measured in the ^{115}In(p,p_0)^{115}In reaction with surface-barrier counters. The scattering anomalies were identified as isobaric analogue resonances in the compound nucleus. Their resonance energies and widths were determined from an excitation function of the ^{115}In(p,n)^{115}Sn reaction over the same energy range with a long counter. Six excited states in ^{116}In are proposed, and some of their properties are derived. A proton spectrum measured from the ^{115}In(d,p)^{116}In reaction also indicated the existence of these levels at 0.12, 0.21, 0.31, 0.42, 0.49, and 0.64 Mev. Their nature is discussed and is compared with previous data. (auth)

46649 THE MAGNETIC MOMENT OF THE FIRST EXCITED STATE OF ^{143}Pr. Zmora, H.; Ofer, S.; Rakavy, M. (Hebrew Univ., Jerusalem). Nucl. Phys., 89: 225-9(1966).

A value of 1.03 ± 0.08 was found for the gyromagnetic ratio of the 57-kev level of ^{143}Pr from measurements of the perturbation of the angular correlation of the 293–57 kev gamma cascade of ^{143}Pr in external magnetic fields. Measurements were carried out with ^{143}Ce sources in the form of dilute solutions at room temperature and with a CeO_2 source at 1400°K, where the paramagnetic correction β is relatively small. The measurements indicate that the Pr ion in aqueous solutions reaches the 3^+ state in a time shorter than 4 ns after the β decay. (auth)

46650 SHELL-MODEL CALCULATIONS IN THE CONTINUUM. Bauer, M. (Univ., Mexico, Mexico City); Prats, F. Nucl. Phys., 89: 230-40(1966).

Shell-model calculations include very often single-particle configurations whose energy is larger than the particle emission threshold in the corresponding channel. Nevertheless, the continuum nature of the energy spectrum is not taken into account and only a discrete eigenvalue problem is solved. In this paper, the schematic Brown model is extended to include configurations in the energy continuum. It is shown that, if there are potential resonances, an "equivalent" discrete problem can be found, thereby giving an overall justification of the usual procedure. At the same time, the limitations of the "equivalent" discrete problem in reproducing the features of the actual problem are exhibited. (auth)

46651 THE LEVEL STRUCTURE OF ^{140}La AND ^{142}Pr FROM THE (n,γ) REACTION. Hughes, L. B.; Kennett, T. J.; Prestwich, W. V. (McMaster Univ., Hamilton, Can.). Nucl. Phys., 89: 241-53(1966).

A study of the ^{139}La(n,γ)^{140}La and ^{141}Pr(n,γ)^{142}Pr reactions using a Ge(Li) spectrometer has given neutron separation energies of 5165 ± 5 and 5842 ± 5 kev, respectively. Both nuclei have reasonably simple spectra for doubly-odd species due to the 83-neutron configuration. About 40 high-energy transitions were found in each case, and for ^{140}La the reduced dipole width to f-wave neutron states appears wider than to p-wave states. The low-energy transitions for both nuclei were also examined. (auth)

46652 THE REACTION ^{39}K(n,γ)^{40}K. Kennett, T. J.; Hughes, L. B.; Prestwich, W. V. (McMaster Univ., Hamilton, Can.). Nucl. Phys., 89: 254-66(1966).

The gamma radiation from the ^{39}K(n,γ)^{40}K reaction was studied using a Ge(Li) spectrometer. A total of 65 transitions was observed with an average precision of 3 kev. The neutron separation energy was found to be 7797 ± 3 kev. A detailed comparison with (d,p) results reveals that the M1 and E1 strengths are almost equal as are the transitions to l_n = 1 and l_n = 3 levels. The results presented indicate that this reaction proceeds mainly through compound nucleus formation. (auth)

46653 STUDY OF NUCLEAR ISOMERS WHICH DECAY BY SPONTANEOUS FISSION. Brenner, D. S.; Westgaard, L.; Bjoernholm, S. (Univ. of Copenhagen). Nucl. Phys., 89: 267-72(1966).

Data are presented for the pulse-height distribution of fission fragments which result from the spontaneous fission decay of the 14-msec ^{242}Am isomer, indicating a normal asymmetric yield-mass distribution for the fragments. The partial cross section for production of the isomer by 12-Mev deuteron bombardment of ^{242}Pu and the spontaneous fission half life are determined to be 8 ± 3 μb and 16.7 ± 1.5 msec, respectively. A search was made for isomers which decay by spontaneous fission produced in

deuteron bombardments of ^{232}Th, ^{235}U, ^{238}U, ^{239}Pu, ^{241}Am, and ^{243}Am and proton bombardment of ^{243}Am. Upper limits are established for spontaneous fission decay with half lives in the ranges 10–20 μsec to 1 hr. A comparison is made between experimental data from deuteron bombardments of ^{242}Pu and the results of calculations based on the compound-statistical model. (auth)

46654 CORRECTIONS ON NUCLEAR MATRIX ELEMENTS CAUSED BY PARTICLE-NUMBER FLUCTUATION EFFECTS OF THE BCS FUNCTION. Krumlinde, J. (Lund Inst. of Tech., Sweden). Nucl. Phys., 89: 273-87(1966).

An approximate method to correct for particle-number fluctuations on BCS nuclear matrix elements, which is based on a saddle-point projection method, is developed. General expressions are given for a model with constant pairing matrix elements. Correction factors are also calculated for a "continuous" or "homogeneous" model. Finally, numerical values are given by this method and by exact projection for a uniform model containing 32 (or 33) levels. It is found that in relevant cases the correction is small and, in general, is fairly well reproduced by the method discussed. (auth)

46655 DEUTERON OPTICAL POTENTIAL IN THE ADIABATIC APPROXIMATION. Testoni, J.; Gomes, L. C. (Univ., Sao Paulo, Brazil. Comision Nacional de Energia Atomica, Buenos Aires). Nucl. Phys., 89: 288-304(1966).

The deformation of the deuteron in the presence of a target nucleus is studied in the adiabatic approximation. Its effect on the deuteron optical potential is discussed. The contribution of deuteron break-up to this potential is also calculated. (auth)

46656 THE MAGNETIC MOMENT OF THE 5$^-$ STATE OF ^{116}Sn AND OTHER SPECTROSCOPIC INVESTIGATIONS IN THE DECAY OF ^{116}Sb AND ^{116}In. Nucl. Phys., 89: 305-23(1966).

The g-factor of the 5$^-$ state of ^{116}Sn at 2369 kev was measured by observing the rotation of the 545-1075 kev γγ angular correlation in external magnetic fields. The result agrees well with the Schmidt value for the pure, two-neutron, shell-model configuration $(h_{11/2}, s_{1/2})_{5^-}$; it disagrees, however, with recent theoretical predictions which postulate rather strong admixtures of the $(h_{11/2}, d_{3/2})_{5^-}$ configuration. An additional level of ^{116}Sn was observed at 3215 kev. It is directly populated by EC and β^+-decays of ^{116}Sb. It decays by a γ transition of 846 kev to the 5$^-$ state or by a γ transition of 438 kev to the 6$^-$ state. The 438-kev line fits only into the decay scheme if the 136-kev line sits on top of the 410-kev line. The order of these last two lines was uncertain previously. The half life of the 5$^-$ state at 2369 kev was redetermined to be $3.5 \pm 2.0 \times 10^{-7}$ sec, and the half lives of the 2914- and the 3215-kev states were determined to be $T_{1/2} \leq 5 \times 10^{-10}$ sec. The γγ angular correlation measurements on eight different cascades in the decay of ^{116}Sb confirmed the spin and multipolarity assignments of previous investigations. The spin 7$^-$ was assigned to the level at 3215 kev. The small ft value of the β-decay which populates this state excludes smaller spins and the opposite parity; the high transition rates of the following γ decays exclude higher spins. (auth)

46657 DECAY OF ^{121m}Sn AND ^{121m}Te. Locker, B. (Bar-Ilan Univ., Ramat-Gan, Israel); Hazony, Y. Nucl. Phys., 89: 324-8(1966).

The low-energy γ spectrum of ^{121}Sb was measured in coincidence with the 0.4-Mev β rays from the decay of ^{121m}Sn and with the 1.1-Mev γ rays from ^{121m}Te. A previously unreported transition of 9 ± 0.5 kev was found. (auth)

46658 THE NUCLEAR SHELL BEHAVIOR AND CROSS-SECTION TRENDS FOR 14-Mev NEUTRONS. Majumdar, N. K. (Saha Inst. of Nuclear Physics, Calcutta). Nucl. Phys., 89: 329-36(1966).

A statistical theory calculation was performed of Te(n,α) cross sections by using the Bethe-Hurwitz level density expression, and the results were compared with previous experimental results. Complete numerical agreement is obtained. It is found that a significant contribution to the decay probability comes from the energy region close to E_{max} and hence the Q-dependence of $\sigma_{n,\alpha}$ values. In Q-trends of isotopes, a gross n-subshell effect can be noticed. This effect was considered in reference to the shell behavior of the binding energies of the target and residual nuclei. These binding energies also reflect the order of subshell filling. The energy differences within a subshell are due to the residual interactions of which the pairing force is important. (auth)

46659 STATES OF ^{208}Pb FROM DOUBLE TRITON STRIPPING. Bjerregaard, J. H. (Univ. of Copenhagen); Hansen, Ole; Nathan, O.; Hinds, S. Nucl. Phys., 89: 337-47(1966).

The reaction ^{206}Pb(t,p)^{208}Pb was investigated at an incident energy of 12 Mev, the protons being momentum analyzed in a multi-angle magnetic spectrograph. A total of 56 excited states of ^{208}Pb was observed up to an excitation energy of 7.6 Mev. Strong excitations were found for the ground state, the 2.62-Mev 3$^-$ state and the 3.20-Mev 5$^-$ state, but the 3.71-Mev 5$^-$ state was not observed. The different behavior of these states in (d,p), (t,p) and inelastic scattering experiments is discussed. A state at 4.87 Mev in ^{208}Pb is assigned 0$^+$ from the shape of the corresponding (t,p) angular distribution which has deep minima at 35 and about 75°. No other excited 0$^+$ states of ^{208}Pb could be identified from the (t,p) data. It is demonstrated that the existence of two or three sharp minima, the positions of which depend smoothly on the mass number, is a characteristic feature of L = 0 (t,p) angular distributions over a wide range of nuclei. For L = 3 and L = 5, the Pb(t,p) angular distributions at 12-Mev bombarding energy have less characteristic shape than for L = 0. (auth)

46660 THE 114-kev LEVEL IN ^{149}Pm. Svensson, A. G.; Bostroem, L.; Joshi, M. C. (Uppsala Univ.). Nucl. Phys., 89: 348-58(1966).

The magnetic moment of the 114-kev level in ^{149}Pm was determined by the perturbed γ-γ angular correlation method with the result $\mu = 2.40 \pm 0.30$ nm. Angular correlations were measured for the 542-114, 424-114 and 268-270 kev cascades. Spins for the 538- and 270-kev levels were determined to be $^5/_2$ and $^7/_2$, respectively. The half life of the 114-kev level was measured with the result $T_{1/2} = 2.52 \pm 0.12$ nsec. The magnetic moment is discussed in an intermediate coupling scheme. (auth)

46661 CONVERSION-ELECTRON COINCIDENCES IN THE DECAY OF ^{184}Re. Dzelepow, B. S.; Tischkin, P. A.; Schischelow, I. A. (Leningrad State Univ.). Nucl. Phys., 89: 359-68(1966). (In German).

The spectrum of internal conversion electrons from ^{184}Re ($T_{1/2}$ = 167 d) was investigated by electron-electron coincidences. The measurements were done using a double toroidal beta spectrometer with an iron core. The 84- and 105-kev transitions in ^{184}Re are coincident. The 55- and 162-kev transitions are delayed ≧ 1 μsec relative to the 111-kev transition in ^{184}W. (auth)

46662 DAMPING OF ISOBARIC ANALOGUE STATES. De Toledo Piza, A. F. R. (Massachusetts Inst. of Tech., Cambridge. Laboratory for Nuclear Science, Cambridge, Mass.); Kerman, A. K.; Fallieros, S.; Venter, R. H. Nucl. Phys., 89: 369-76(1966). (NYO-3525-9).

The spreading width of analog states due to the Coulomb interactions in a nucleus is calculated. The coupling to single-particle, two particle-one hole and three particle-two hole configurations is considered. The effect of nuclear interactions is taken account in the large energy separation between the analogue and the configuration states (symmetry energy displacement) and in the natural distribution of the latter representing their fragmentation. The spreading widths are found to be small, less than 3 kev in ^{89}Y and ^{91}Nb. (auth)

46663 POLARIZATION NEAR ISOBARIC ANALOGUE RESONANCES. Adams, J. L.; Thompson, W. J.; Robson, D. (Florida State Univ., Tallahassee). Nucl. Phys., 89: 377-86(1966).

For the purpose of analyzing isobaric analogue resonances, a single-level resonance formula was incorporated into nuclear scattering amplitudes found with an optical-model potential. The inclusion of the resonance term leads to polarization magnitudes that are easily measurable. By observing the variation of the polarization near the resonance energy, the j-value of the resonance can be definitely assigned. The method is applicable for resonances with partial widths as low as 5 to 10% of the total width. Because the j-value of the resonance can be extracted even with a very crude polarization experiment, an important new spectroscopic tool is available for finding the j-value of such levels. Examples of data and theoretical polarization curves for various medium to heavy nuclei are given. (auth)

46664 PROJECTION TECHNIQUES IN NUCLEAR STRUCTURE. I. Kelson, I. (Yale Univ., New Haven). Nucl. Phys., 89: 387-400(1966).

Projection techniques are formulated and are analyzed. They prove to be efficient because they obviate the explicit construction of orthonormal sets of states and because they almost exclusively employ one-body operators. Their use in nuclear structure calculations is strongly urged. (auth)

46665 ALPHA PARTICLES FOLLOWING THE β DECAY OF ^{12}B AND ^{12}N. Schwalm, D.; Povh, B. (Univ., Freiburg i. B.). Nucl. Phys., 89: 401-11(1966).

The 10.3 ± 0.3-Mev state in ^{12}C, populated by the β decay of ^{12}B and ^{12}N, decays by α emission to the ground state of ^{8}Be; its width is 3.0 ± 0.7 Mev. The population and decay of the 10.3-Mev state limit the spin to $J^{\pi} = 0^{+}$ or 2^{+}. The 12.7-Mev state in ^{12}C, populated by the β decay of ^{12}N, decays by α emission to the $J^{\pi} = 2^{+}$ first excited state of ^{8}Be. The formation and decay of the 12.7-Mev state uniquely determine the spin as $J^{\pi} = 1^{+}$. The estimated value of log ft = 3.7 for the β decay of ^{12}N to the 12.7-Mev state indicates that this state is closely related to of the ^{12}N ground state. (auth)

46666 LIFETIMES OF THE FIRST EXCITED STATES IN ^{118}Sn AND ^{120}Sn BY THE NUCLEAR GAMMA-RAY RESONANCE METHOD. Hrastnik, B.; Knapp, V.; Vlatkovic, M. (Ruder Boskovic Inst., Zagreb. Univ. of Zagreb). Nucl. Phys., 89: 412-18(1966).

The resonance scattering from Sn of 1.22-Mev ^{118}Sb and 1.18-Mev ^{120}Sb gamma rays was observed using the recoil of the previous transitions and additional thermal broadening to restore the recoil losses. From the attenuation factor measured in the self-absorption experiment, the mean life of the 1.22-Mev level in ^{118}Sn was found to be 0.635 ± 0.055 psec, while for the mean life of the 1.18-Mev level in ^{120}Sn the value of 1.26 ± 0.24 psec was obtained. (auth)

46667 ELASTIC AND INELASTIC SCATTERING OF HEAVY IONS. Bassel, R. H.; Satchler, G. R.; Drisko, R. M. (Oak Ridge National Lab., Tenn.). Contract W-7405-eng-26. Nucl. Phys., 89: 419-32(1966). (ORNL-P-2142).

The elastic and inelastic scattering of heavy ions from nuclei are considered in terms of a generalized optical model. Amplitudes for the single excitation of target or projectile are evaluated in the distorted-wave approximation, while amplitudes for more complicated excitations, such as double excitation or mutual excitation of both nuclei, are calculated using the derivative relations of Austern and Blair. For the special case of double excitation, the results of the Austern and Blair theory are compared with the predictions of a coupled Schrödinger equations calculation. Spectroscopic information derived from these analyses is in good agreement with previous analyses. (auth)

46668 MOESSBAUER EFFECT STUDIES OF THE 58-kev LEVEL OF ^{159}Tb. Atzmony, U.; Bauminger, E. R.; Ofer, S. (Hebrew Univ., Jerusalem). Nucl. Phys., 89: 433-42(1966).

The recoilless absorption spectra of the 58-kev γ rays from ^{159m}Tb in ^{159}Tb situated in Tb_2O_3, $TbAl_2$, Tb metal, and $TbFe_2$ were measured at temperatures ranging from 20°K to room temperature. The sources used were ^{159}Dy and ^{159}Gd in oxide form. All absorbers gave unsplit absorption lines. From the width measured at room temperature with an oxide source and absorber, a value of $T_{1/2} \geq (1.05 \pm 0.15) \times 10^{-10}$ sec was obtained for the half life of the 58-kev level. From the broadened absorption line obtained with the Tb metal absorber, a value of 1.50 ± 0.10 nm was obtained for the magnetic moment of the 58-kev level of ^{159}Tb, though a value of 2.10 ± 0.15 nm can not unambiguously be excluded. The line width and shape obtained with a $TbFe_2$ absorber, where the internal field is about 15% higher than in Tb metal, are consistent with the previously mentioned magnetic moment of the excited state. (auth)

46669 QUADRUPOLE PLUS PAIRING FORCE FOR DEFORMED NUCLEI. Gunye, M. R. (Atomic Energy Establishment, Trombay, India); Das Gupta, S. Nucl. Phys., 89: 439-64(1966).

The approximation made by Baranger and Kumar, Bés and others in deriving the properties of deformed nuclei are investigated in detail. The major approximations are the neglect of the exchange term of the quadrupole force in the Hartree-Fock potential and the pairing potential of the quadrupole force. It is shown that for predictions of the ground-state deformation, two quasiparticle states, and the energies of the vibrational states, these approximations are valid. The Nilsson model for nuclear deformations is compared with the self-consistent calculations using the quadrupole force. It is concluded that in the former, the core must be included explicitly whereas in the latter, the core can be neglected by renormalizing the quadrupole force strength. (auth)

46670 EXTENDED QUASI-PARTICLE-PHONON COUPLING THEORY FOR ODD-MASS SPHERICAL NUCLEI. Sherwood, Arnold I. (Univ. of California, San Diego, La Jolla); Goswami, Amit. Nucl. Phys., 89: 465-80(1966).

The low-lying states of an odd-mass spherical nucleus are considered to be states of a quasiparticle coupled to an even core. The quasiparticle modes are obtained by the Bogolyubov-Valatin transformation. The coupled linearized equations for the amplitudes of excitation of the states of the odd-mass nucleus are obtained by the equation-of-motion method. The problem is formulated so that only amplitudes of single excitations appear, as this automatically ensures hermiticity, in contrast to the second random phase approximation. This is accomplished by employing an expansion in terms of a complete set of states of the even core. The states of the core are treated by the random phase approximation. This method is called extended quasiparticle-phonon coupling (EQPC) as it can be regarded as an extension of the usual quasiparticle-phonon coupling (QPC) through the inclusion of the "backward-going" amplitudes. Preliminary numerical calculations, based on the pairing plus quadrupole force effective Hamiltonian, show that the effects of "backward-coupling" are very pronounced in the odd-mass isotopes of Tc, Rh and Ag. This mechanism seems to provide an explanation for the occurrence of low-lying phonon levels in these nuclei. The self-consistency of the theory is also discussed. (auth)

46671 ABSOLUTE CROSS SECTIONS AND EXCITATION FUNCTIONS FOR α-PARTICLE-INDUCED REACTIONS OF ^{165}Ho, ^{164}Er, ^{166}Er, AND ^{167}Er. Martin, G. C. Jr.; Pilger, R. C. Jr. (Univ. of Notre Dame, Ind.). Nucl. Phys., 89: 481-96(1966).

Absolute cross sections and excitation functions for α-induced-reactions were measured from 16 to 40.5 Mev by activation and stacked-foil techniques. The following reactions were observed: ^{165}Ho(α,n)^{168}Tm, ^{165}Ho(α,2n)^{167}Tm, ^{165}Ho(α,3n)^{166}Tm, ^{165}Ho(α,4n)^{165}Tm, ^{164}Er(α,n)^{167}Yb, ^{164}Er(α,2n)^{166}Yb, ^{164}Er(α,3n)^{165}Yb, ^{166}Er(α,3n)^{167}Yb, ^{166}Er(α,4n)^{166}Yb, ^{166}Er(α,pn)^{168}Tm, ^{167}Er(α,4n)^{167}Yb and ^{167}Er(α,p2n)^{168}Tm. (auth)

46672 EXPERIMENTAL STUDY OF THE EXCITED STATES OF ^{151}Sm. Locard, P. (CEN, Grenoble, France); Berthier, J.; Hocquenghem, J. C.; Henck, R. Nucl. Phys., 89: 497-512(1966). (In French).

The gamma spectrum resulting from the decay of ^{151}Pm (28 hr) was studied with a lithium-drifted germanium detector; these data give the gamma energies and intensities (above 100 kev). The γ-γ coincidence spectra were studied with a scintillation spectrometer using NaI(Tl) crystals. The investigation of these coincidences leads to a modification of the level scheme proposed by Bertelsen, the level at 405.5 and 650 kev are suppressed, and levels are added at 245.6, 306.6, 522, 952 and 962 kev. (auth)

46673 L SUBSHELL RATIOS IN SOME PURE E2 TRANSITIONS. Karlsson, Sven-Erik; Andersson, Ingemar; Nilsson, Oerjan; Malmsten, Goeran; Nordling, Carl; Siegbahn, Kai (Uppsala Univ.). Nucl. Phys., 89: 513-22 (1966).

The L subshell conversion line intensity ratios were studied for four $2^+ \rightarrow 0^+$ transitions (86.79 kev in ^{160}Dy, 80.57 kev in ^{166}Er, 84.26 kev in ^{170}Yb, and 100.09 kev in ^{182}W) and for the $5/2^- \rightarrow 1/2^-$ 99.07-kev transition in ^{183}W. The L_{II}/L_{III} ratios obtained agree very well with theory but the L_I/L_{II} and L_I/L_{III} ratios are 5-9% higher than the theoretical ratios. Deviations of the same magnitude were also reported by other research groups. (auth)

46674 NUCLEAR BREMSSTRAHLUNG FROM 140-Mev PROTONS. Edgington, J. A. (Cambridge Univ., Eng.); Rose, B. Nucl. Phys., 89: 523-52(1966). (AERE-R-5167).

Differential cross sections and rough energy spectra for bremsstrahlung production were measured under 140-Mev proton bombardment of H, D, Be, C, N, O, Al, Cu and Pb. The total cross section per neutron in the target nuclei for protons above 40 Mev varied from $\approx$4.5 μb to $\approx$2 μb from D to Pb. The observed cross section for the p-p system was -0.06 ± 0.05 μb. The data from nuclei are in reasonable agreement with the limited experimental data available and with the theory of Beckham. The p-p value is much lower than any theoretical estimate. (auth)

46675 SYMMETRY TERM IN NUCLEAR POTENTIALS. Sood, P. C. (Univ. of Alberta, Edmonton). Nucl. Phys., 89: 553-60(1966).

The discrepancies observed with the empirical data, when the Coulomb correction term is included in the proton potential, are pointed out. The changes in the value of the symmetry term brought about by omitting this correction term are investigated. Other factors which lead to an ambiguity or uncertainty in the determination of the symmetry potential are presented. The available information yields $V_1 = 30 \pm 10$ Mev as the coefficient of the $(N-Z)/A$ dependent term in the real potential. (auth)

46676 MEASUREMENT OF THE L + M + .../K ELECTRON CAPTURE RATIO IN THE DECAY OF ^{125}I. Smith, K. M.; Lewis, G. M. (Glasglow Univ.). Nucl. Phys., 89: 561-4(1966).

Using the "well-type" internal source scintillation spectrometer technique, a value of 0.253 ± 0.005 was obtained for the L + M +.../K electron capture ratio in the decay of ^{125}I to the 35.4-kev excited state of ^{125}Te. This corresponds to an atomic mass difference of 153 ± 5 kev between the ground states of ^{125}I and ^{125}Te. Less than 1% of capture transitions were found to go directly to the ground state of ^{125}Te. (auth)

46677 SEARCH FOR NUCLEAR STRUCTURE EFFECTS IN THE K-CONVERSION COEFFICIENT OF THE 385-kev TRANSITION IN ^{197}Tl. Schmidt-Ott, W.-D.; Smend, F.; Weirauch, W.; Flammersfeld, A. (Univ., Goettingen, Ger.). Nucl. Phys., 89: 565-70(1966).

The gamma-gamma directional correlation of the $9/2^-$ (E3)$3/2^+$ (M1 + E2)$1/2^+$ cascade in the decay of ^{197m}Tl (0.55 sec) was measured yielding an anisotropy $A = 0.31 \pm 0.05$ and an angular correlation coefficient $A_{22} = 0.19 \pm 0.03$. In addition, the K-conversion coefficient of the 385-kev transition was redetermined from coincidence experiments. The value obtained is $\alpha_{K385} = 0.103 \pm 0.010$. The experiments were performed in order to search for nuclear structure effects in an internal conversion of the strongly retarded 385-kev M1 transition. The experimental data are consistent with $\lambda = 3.4 \pm 3.5$ where, λ is defined as the ratio of the penetration matrix element to the normal γ-ray matrix element. (auth)

46678 THE K-FORBIDDEN BETA DECAY OF ^{154}Eu. Hansen, P. G.; Nielsen, H. L.; Wilsky, K. (Research Establishment, Riso, Denmark). Nucl. Phys., 89: 571-6(1966).

The β^- decay of 13-yr ^{154}Eu(3^-) to the 123-kev 2^+ level and the 371-kev 4^+ level in ^{154}Gd was investigated in a β-γ coincidence experiment by means of a six-gap beta spectrometer. Intensities of $9.2 \pm 1.5\%$ and $0.19 \pm 0.05\%$ were obtained for the two beta groups. Only for the strong group was it possible to study the shape; the experiment shows a pronounced deviation from the statistical shape corresponding to the value (1.0 ± 0.3) for the parameter Y^2 of the modified B_{ij} approximation. This value is also consistent with the available β-γ angular correlation data. The branching ratios to the 2^+ and 4^+ levels for the components of multipole orders 1 and 2 both strongly violate the generalized intensity rules for K-forbidden transitions in deformed nuclei, and a comparison is made with similar cases. (auth)

46679 APPLICATION OF THE STRONG COUPLING ROTATIONAL MODEL TO ODD-MASS NUCLEI IN THE 1p SHELL. El-Batanoni, F.; Kresnin, A. A. (Atomic Energy Establishment, Cairo). Nucl. Phys., 89: 577-89(1966).

Odd-mass nuclei in the 1p shell were investigated strictly within the framework of the strong-coupling rotational model. It is shown that energy spectra, magnetic and quadrupole moments of ground states, and ft values for β transitions between ground states of these nuclei may be fairly well described by the model. The effect of the Coriolis mixing term and rotation vibration interaction was neglected in the calculations. (auth)

46680 A HIGH-RESOLUTION STUDY OF ISOBARIC ANALOGUE RESONANCES IN ^{41}K. Keyworth, G. A.; Kyker, G. C. Jr.; Bilpuch, E. G.; Newson, H. W. (Duke Univ., Durham, N. C.). Nucl. Phys., 89: 590-608(1966).

Cross sections for ^{40}Ar(p,p)^{40}Ar and ^{40}Ar(p,α)^{37}Cl were measured from 1.63 to 2.60 Mev at a lab angle of 135° and with an energy resolution of about 250 ev. The ^{40}Ar(p,n)^{40}K cross section was measured from threshold (2.344 Mev) to 2.60 Mev. Almost all single elastic scattering resonances near 1.87 and 2.45 Mev can be interpreted as fine structure of the isobaric analogues of the fourth ($J^\pi = 3/2^+$) and sixth ($J^\pi = 1/2^+$) excited states of ^{41}Ar. These two analogue resonances appear primarily as an enhancement of the normal ($T = T_z$) states in the compound nucleus. Two very narrow elastic scattering resonances are also observed near 1.1 Mev. These data are interpreted in the light of recent theoretical work on isobaric analogue resonances. (auth)

46681 RADIOACTIVE DECAY OF ^{129}Cs. Rezanka, I.; Spalek, A.; Frana, J.; Mastalka, A. (Inst. of Nuclear Research, Rez, Czech.). Nucl. Phys., 89: 609-22(1966).

The decay of ^{129}Cs was investigated using Ge(Li) detectors and double-focusing β spectrometers. Seven previously unreported transitions in ^{129}Xe were found. The L-subshell ratios were determined for the 39.6-kev and 93.2-kev transitions. The E2 admixture in the latter is <1.6%. Two previously unreported levels at 321.3 ± 0.2 kev ($5/2^+$) and at 903.1 ± 0.5 kev ($1/2^+$ or $3/2^+$) and a third possible level at 819 ± 2 kev are reported. The spins $1/2^+$ and $3/2^+$ for the 411.1- and 578.8-kev levels, respectively, were determined. The spin $3/2^+$ for the 944.7-kev level is probable. The comparison with the pairing plus quadrupole model is discussed. (auth)

46682 SURFACE EFFECTS ON THE NUCLEAR ENERGY GAP. Kennedy, Roger C. (Australian National Univ., Canberra). Nucl. Phys., 89: 623-31(1966).

Two finite nuclear slab models are considered having high- and low-density surface regions. The energy gap is found by solving the BCS integral equation using a phenomenological, nonlocal, separable, two-body potential acting in s-waves only. The matrix elements of this interaction with the model states are examined for their energy depen-

dence. It is found that the more attractive components of the matrix element corresponding to the low-density model are responsible for an energy gap which is an order of magnitude greater than that of the model of the same size having the high-density surface region. (auth)

46683 POLARIZATION IN p-^{3}He ELASTIC SCATTERING. Drigo, L.; Manduchi, C.; Nardelli, G. C.; Russo-Manduchi, M. T.; Tornielli, G.; Zannoni, G. (Univ., Padua. Istituto di Fisica Galileo Galilei, Padua). Nucl. Phys., 89: 632-40(1966).

A systematic investigation was carried out of the angular dependence of the polarization and cross section in p-^{3}He elastic scattering at angles ranging from 50 to 130° in the laboratory system for eight proton energies between 2.38 and 4.46 Mev. The results are in agreement, within the experimental uncertainties, with the predictions of phase-shift analyses of elastic scattering angular distributions by Tombrello. The agreement with the 4.05-Mev measurements of McDonald is good. A contour map of percent polarization, as a function of energy and center-of-mass angle, is also given. (auth)

46684 ANISOTROPY OF CONVERSION ELECTRONS FROM VIBRATIONAL LEVELS AND ROTATIONAL LEVELS EXCITED BY (p,2n) REACTIONS. Ejiri, Hiroyasu (Tokyo Univ.); Ishihara, Masayasu; Sakai, Mitsuo; Inamura, Takashi; Katori, Kenji. Nucl. Phys., 89: 641-55 (1966).

The vibrational levels and the rotational levels in medium and heavy nuclei were excited by (p,2n) reactions with 14.3-Mev protons. The anisotropy of the conversion electrons from the excited states was observed by means of a double-focusing beta spectrometer. The observed anisotropy showed systematic features, depending on the spins of the target, the excited levels associated with the transition, and the multipolarity. The analysis of the anisotropy was made in terms of the statistical continuum theory. The systematical trend of the observed anisotropy was reproduced by the calculations. The angular distribution of the gamma rays from such nuclear reactions was found to be very useful for the study of the properties of the residual excited state and the transition. (auth)

46685 NEUTRON DECAY OF THE 2.43-Mev AND 3.03-Mev STATES IN ^{9}Be TO ^{8}Be(g.s.). Christensen, P. R.; Cocke, C. L. (California Inst. of Tech., Pasadena). Nucl. Phys., 89: 656-72(1966).

Neutron decay from states at 2.43- and 3.03-Mev in ^{9}Be was investigated by populating the states with the reaction ^{7}Li(^{3}He,p)^{9}Be and measuring p-n time-of-flight coincidences. The 2.43-Mev, $5/2^-$ level decays 7.5 ± 1.5% to the ground state of ^{8}Be, while the 3.03-Mev level decays nearly 100% by this mode. The l = 3 neutron reduced width of the 2.43-Mev level for the ground state of ^{8}Be (in units of $\hbar^2/mR^2$) is $(2.1 \pm 0.6) \times 10^{-2}$, when R has the value 4.35 fm. The non-zero transition probability for the decay of the 2.43-Mev level to ^{8}Be(g.s.) can be explained by assuming that the 2.43-Mev state in ^{9}Be is deformed. (auth)

46686 DEFORMATIONS IN THE CALCIUM REGION. Bertsch, George F. (Princeton Univ., N. J.). Nucl. Phys., 89: 673-85(1966).

A deformed model is applied to the excited states of the nuclei ^{40}Ca, ^{42}Ca and ^{41}Ca. The deformed states are based on two-particle, two-hole, Nilsson wave functions and have admixtures of the shell-model states induced by a two-body force. The electromagnetic matrix elements, stripping and pick-up reactions and energy systematics are compared with experiment. Agreement is reasonable for ^{40}Ca, but there is disagreement and possibly inconsistency of the model with experiment in ^{42}Ca. (auth)

46687 AN INVESTIGATION INTO THE LOWER EXCITED STATES OF ^{46}Ti. Mo, J. N.; Twin, P. J.; Willmott, J. C. (Univ. of Liverpool). Nucl. Phys., 89: 686-96(1966).

The decay schemes of levels at 0.89, 2.01, 2.61, 2.96, 3.06, 3.17, and 3.23 Mev in ^{46}Ti were measured using the (p,γ) coincidence technique following inelastic proton scattering of an enriched target. The 2.01-, 2.61-, and 2.96-Mev levels decay to the 0.89-Mev level, the 3.06-Mev level to the 2.01-Mev level, and the 3.17- and 3.23-Mev levels to both the 0.89-Mev level and the ground state. The triple correlation method was used to establish spins of 4, 0, and 2 to the 2.01-, 2.61- and 2.96-Mev levels, respectively. (auth)

46688 LOW-LYING STATES WITH T = 2 OF A = 16 NUCLEI AND T = 3/2 OF A = 15 AND 17 NUCLEI. Soga, Michitoshi (Franklin Inst., Swarthmore, Pa.). Contract AT(30-1)-3525. Nucl. Phys., 89: 697-704(1966). (NYO-3525-8).

The lowest members of the T = 2 levels of A = 16 nuclei and T = 3/2 levels of A = 15 and 17 nuclei are described by the product wave functions of low-lying hole states of A = 14 and 15 nuclei and low-lying particle states of A = 17 and 18 nuclei. The hole-hole interactions are taken from the analysis of the p-shell nuclei and the particle-particle interactions are taken from the analysis of the s-, d-shell nuclei. The hole-particle interactions are taken from the experiment T = 1 levels of ^{16}O and the individual hole and particle energies. A variable parameter of the $p_{3/2}$ hole-$d_{5/2}$ particle interaction is used. The results are consistent with available experimental data. (auth)

46689 BINDING OF A Λ IN NUCLEAR MATTER. Downs, B. W.; Grypeos, M. E. (Oxford Univ.). Nuovo Cimento (10), 44B: 306-14(Aug. 11, 1966).

The results of a variational calculation of the binding energy D of a Λ in nuclear matter, based on an extension of the Jastrow method for nuclear binding energies, are presented. For direct two-body Λ-N interactions, these results are in approximate agreement with those based on independent-pair approximations, which are also discussed. Neither of these methods has been fully explored, but current theoretical estimates of D indicate the presence of a significant space-exchange component in the two-body Λ-N interaction and/or a three-body force which leads to a negative contribution to D. (auth)

46690 LEVEL WIDTH OF ATOMIC NUCLEI IN THE CONTINUUM ENERGY REGION: COMPARISON WITH THE STATISTICAL-MODEL PREVISIONS. Gadioli, E. (Univ., Milan. Istituto Nazionale di Fisica Nucleare, Milan); Iori, I.; Marini, A.; Sansoni, M. Nuovo Cimento (10), 44B: 338-54(Aug. 11, 1966).

A theoretical expression for the coherence energy which characterizes the Ericson fluctuations of an excitation function is derived in the framework of the statistical model. It is given by a weighted average over spins, parity, and energy of the widths of the levels of the compound nucleus involved in the reaction. The case of purely statistical reactions and the case in which a nonstatistical effect is present are analyzed. (auth)

46691 THE (e,e'p) REACTION IN CALCIUM INDUCED BY 580–750 Mev ELECTRONS. Amaldi, U. Jr.; Venuti, G. Campos; Cortellessa, G.; de Sanctis, E.; Frullani, S.; Lombard, R.; Salvadori, P. (Istituto Superiore di Sanita, Rome). Phys. Lett., 22: 593-5(Sept. 15, 1966).

The spectrum of electron-proton coincidences in calcium as a function of the incoming electron energy is presented and the results are briefly discussed. (auth)

46692 COINCIDENCE EXPERIMENT ON THE ELEMENTARY PROCESS OF BREMSSTRAHLUNG PRODUCTION. Nakel, W. (Univ., Tuebingen, Ger.). Phys. Lett., 22: 614-15(Sept. 15, 1966). (In German).

By using a coincidence method the angular distribution of bremsstrahlung is measured for a definite energy loss and a definite angle of the outgoing electron, at an incident electron energy of 300 kev. (auth)

46693 NUCLEAR ENHANCEMENT OF T VIOLATION EFFECTS. Ericson, T. E. O. (CERN, Geneva). Phys. Lett., 23: 97-9(Oct. 10, 1966).

The enhancement factor in non-resonant statistical reactions is shown to be roughly $\sqrt{W/\Gamma}$. Present experiments give the limit $1 - 2 \times 10^{-3}$ for T violation effects in nuclei with a 50% confidence limit. (auth)

46694 COMPOUND NUCLEAR REACTIONS AS A TEST OF T-INVARIANCE. Mahaux, C.; Weidenmueller,

H. A. (Univ., Heidelberg). Phys. Lett., 23: 100-3 (Oct. 10, 1966).

The consequences of a T-violating component of the nuclear forces on the structure of the S-matrix and on the principle of detailed balance are investigated. The one- and two-level cases are considered. In the case of statistical reactions, Ericson's estimate of the enhancement factor is discussed. (auth)

46695 POSSIBLE PROCESS FOR CORE EXCITATION IN EVEN SINGLE CLOSED SHELL NUCLEI. Conjeaud, M.; Harar, S.; Picard, J. (CEN, Saclay, France). Phys. Lett., 23: 104-5(Oct. 10, 1966).

Preliminary results of the reactions ^{115}In(^{3}He,d)^{116}Sn are presented. It is observed that proton particle-hole components of the ground state and first excited levels of ^{116}Sn, are weak. Around an excitation energy of 3.6 Mev, a gross structure appears. (auth)

46696 EFFECTIVE-RANGE THEORY AND THE GROUND STATE OF ^{8}Be. Tombrello, T. A. (California Inst. of Tech., Pasadena). Phys. Lett., 23: 106-8(Oct. 10, 1966).

It is shown that on the basis of the available data the width of the ^{8}Be ground state can not be accurately determined from an effective-range analysis of the S-wave shift for α-α scattering. (auth)

46697 BINDING TO NUCLEAR MATTER. Westhaus, P. (Univ. of Wisconsin, Madison); Clark, J. W. Phys. Lett., 23: 109-11(Oct. 10, 1966).

Variational calculations of the binding energy B_Λ of a Λ particle to nuclear matter based on Jastrow-type trial functions are described. Both zero and first cluster contributions were evaluated. The estimated lower limit on B_Λ is around 40 Mev. (auth)

46698 ON THE NATURE OF THE FIRST EXCITED STATE OF ^{16}O. Hughes, D. J.; Volkov, A. B. (McMaster Univ., Hamilton, Ont.). Phys. Lett., 23: 113-16(Oct. 10, 1966).

Variational calculations show that the first excited state of ^{16}O is predominantly a prolately deformed 2p-2h excitation for a central force which saturates at the correct binding energy, but the excitation energy is much too high. (auth)

46699 INTERNAL CONVERSION COEFFICIENTS WITH RELATIVISTIC HARTREE-FOCK ATOMIC MODEL: COMPARISON WITH ^{67}Zn. Bhalla, C. P. (Argonne National Lab., Ill. Univ. of Alabama, Huntsville); Freedman, M. S.; Porter, F. T.; Wagner, F. Phys. Lett., 23: 116-19(Oct. 10, 1966).

Improved agreement of measured internal conversion coefficients for ^{67}Zn with new calculations based on a relativistic Hartree-Fock treatment with the inclusion of finite nuclear size effects was obtained, in comparison to the earlier conversion-coefficient tabulation. (auth)

46700 ODD PARITY LEVELS IN ^{43}Sc. Flowers, B. H.; Johnstone, I. P. (Univ. of Manchester, Eng.). Phys. Lett., 23: 119-21(Oct. 10, 1966).

An interpretation is given of odd-parity levels in ^{43}Sc, which requires that there are low-lying deformed states arising from three nucleons in the 1f2p major shell. (auth)

46701 SECOND-FORBIDDEN CONTRIBUTIONS TO ISOSPIN-FORBIDDEN (0^+)-(0^+) BETA-TRANSITIONS. Van Neste, L.; Coussement, R.; Deutsch, J. P. (Univ., Louvain, Belg.). Phys. Lett., 23: 122-5(Oct. 10, 1966).

The influence of the usually neglected second-forbidden matrix elements on the determination of isospin impurities from the isospin-forbidden beta-transitions is calculated. It is shown that in some cases this influence may be important and justifies more detailed experimental investigation. (auth)

46702 SHELL-MODEL DESCRIPTION OF DIRECT INELASTIC PROTON SCATTERING FROM ^{18}O. Reif, R. (Central Inst. of Nuclear Research, Rossendorf, Ger.). Phys. Lett., 23: 125-9(Oct. 10, 1966).

In the DWBA a shell-model description with a real effective interaction of Gaussian shape is used to analyze inelastic proton scattering from ^{18}O to the first and second 2^+ states and the first 4^+ state. (auth)

46703 INELASTIC ELECTRON SCATTERING FROM ^{18}O. Grunbaum, L. (Weizmann Inst. of Science, Rehovoth, Israel); Ganguly, N. K. Phys. Lett., 23: 129-32(Oct. 10, 1966).

The results of calculations of the longitudinal and transverse form factors for the even-parity collective levels of ^{18}O are presented. (D.C.W.)

46704 USE OF α(^{3}He,^{3}He)α IN POLARIZATION STUDIES. Thompson, W. J. (Florida State Univ., Tallahessee). Phys. Lett., 23: 132-3(Oct. 10, 1966).

The ^{3}He polarization produced in α-^{3}He elastic scattering in the center-of-mass energy range 7.5 to 9.0 Mev was calculated from phase-shifts which fit recently-measured elastic scattering differential cross sections. The calculated polarization shows a broad plateau of 100% negative polarization with respect to incident energy and scattering angle. This suggests the use of this interaction as a source or analyzer of ^{3}He polarization at medium energies. (auth)

46705 MODEL TO RELATE LEVELS IN AN ISOBARIC MULTIPLET. Tombrello, T. A. (California Inst. of Tech., Pasadena). Phys. Lett., 23: 134-6(Oct. 10, 1966).

A simple two-body model is proposed for relating levels within an isobaric multiplet and is applied to the lowest T = 1 levels of the nuclei with A = 8 and A = 16. (auth)

46706 THE TRANSITION ENERGY OF ^{235m}U. Mazaki, H.; Shimizu, S. (Kyoto Univ.). Phys. Lett., 23: 137-8 (Oct. 10, 1966).

The transition energy of the isomeric state ($\tau^1/_2$ = 26 min) in ^{235}U was determined using a retarding method with a specially designed secondary electron multiplier. The result obtained is 30 ± 3 ev. (auth)

46707 PARITY DETERMINATION OF TWO RESONANCES IN ^{23}Na(p,$\alpha\gamma$)^{20}Ne. Veltman, W. A. M.; Erne, F. C. (Univ., Utrecht). Phys. Lett., 23: 139-40(Oct. 10, 1966).

Even parity was determined for the 308- and 738-kev resonances in the ^{23}Na(p,$\alpha\gamma$)^{20}Ne reaction from measurements of γ angular distributions. Significant orbital-momentum mixture occurs in the formation of the 308-kev resonance. The α particles are emitted with the lowest possible angular momentum at both resonances. (auth)

46708 EVIDENCE FOR THE EXISTENCE OF THE $^6_\Lambda$He HYPERNUCLEUS. Gajewski, W. (Univ. Libre, Brussels); Mayeur, C.; Sacton, J.; (and others). Phys. Lett., 23: 152-4(Oct. 10, 1966).

Evidence for the existence of a particle-stable state of the $^6_\Lambda$He hypernucleus is presented. (auth)

46709 COLLECTIVE STATES OF POSITIVE PARITY IN ^{16}O. Celenza, L. S.; Dreizler, R. M.; Klein, A.; Dreiss, G. J. (Univ. of Pennsylvania, Philadelphia). Phys. Lett., 23: 241-4(Oct. 24, 1966).

A restricted shell model calculation of the so-called excited rotational bands of ^{16}O is outlined. The main advance over previous efforts is the calculation of a two particle-two hole deformed state of minimum energy separated by an energy gap from excited states of a similar character. (auth)

46710 SPECTROSCOPIC AVERAGING. Banerjee, H.; French, J. B. (Univ. of Rochester, N. Y.). Phys. Lett., 23: 245-8(Oct. 24, 1966).

Methods are derived for averaging an operator over sets of m-particle states. Explicit results are given for averaging over all states of m particles in N single-particle states, and for fixed-partition and fixed-isospin averaging. Possible applications are discussed. (auth)

46711 COMBINATORIAL METHODS FOR SPECTROSCOPIC AVERAGING AND SPECTRAL MOMENTS.

French, J. B. (Univ. of Rochester, N. Y.). Phys. Lett., 23: 248-50(Oct. 24, 1966).

The scalar and fixed-partition scalar averagings of an operator are treated by combinatorial methods which exploit the fact that the averages are polynomials in occupation numbers. The results are of particular value for studying the low-order moments of spectral distributions. (auth)

46712 CENTROID ENERGIES AND WIDTHS OF NUCLEAR CONFIGURATIONS. Chang, F. S.; French, J. B.; Ratcliff, K. F. (Univ. of Rochester, N. Y.). Phys. Lett., 23: 251-4(Oct. 24, 1966).

Explicit expressions in terms of the interaction parameters are derived for the centroid energy and the width of an arbitrarily complicated configuration. The results are used to study the configuration structure of the nuclear (ds) shell. (auth)

46713 FREQUENCY OF SPURIOUS INTERMEDIATE RESONANCES IN RANDOMLY GENERATED CROSS SECTIONS. Singh, P. P. (Indiana Univ., Bloomington); Hoffman-Pinther, P.; Lang, D. W. Phys. Lett., 23: 255-7(Oct. 24, 1966).

A program to generate cross sections with parameters chosen in a random fashion from preset distributions showed the existence of spurious "intermediate structures." Calculations based on the model used and scanning of the cross section showed that in a sample of $25\Gamma_{cn}$ there is a 30% chance of finding a resonance $6\Gamma_{cn}$ wide with $\sigma_{peak} = 1.4\sigma_{average}$. (auth)

46714 THE GIANT RESONANCE OF ^{16}O IN THE EIGENCHANNEL REACTION THEORY. Wahsweiler, H. G.; Danos, M.; Greiner, W. (Univ., Frankfurt am Main). Phys. Lett., 23: 257-9(Oct. 24, 1966).

The results of the calculation indicate that the one particle-one hole approximation used is too crude to represent the experimental data. It is felt that a more sophisticated nuclear model can be treated by the present method taking into account the continuum character of the particle states. (auth)

46715 MODIFICATION OF THE EFFECTIVE PARTICLE-HOLE FORCE BY GROUND STATE CORRELATIONS IN PERTURBATION THEORY. de Takacsy, N. (McGill Univ., Montreal. Loyola Coll., Montreal). Phys. Lett., 23: 260-1(Oct. 24, 1966).

The effects of ground-state correlations were included in the effective particle-hole force by second-order perturbation theory. The energy shifts of some negative parity states in ^{16}O and ^{17}O were calculated and, in the case of ^{16}O, were compared with the results obtained using the random-phase approximation. (auth)

46716 ANALYSIS OF PROTON-CARBON ELASTIC SCATTERING IN THE RANGE 20 TO 28 Mev. Lowe, J.; Watson, D. L. (Univ. of Birmingham, Eng.). Phys. Lett., 23: 261-4(Oct. 24, 1966).

The differential cross sections and polarizations for the scattering of 20 to 28 Mev protons by ^{12}C are analyzed by the addition of scattering from three states in ^{13}N to the optical-model scattering. (auth)

46717 SHORT-LIVED ISOMERS OBSERVED IN ALPHA PARTICLE BOMBARDMENTS OF NATURAL ELEMENTS. Ivanov, E. A. (Inst. of Atomic Physics, Bucharest). Phys. Lett., 23: 265-6(Oct. 24, 1966).

Six short-lived isomers were observed in pulsed 24-Mev α-particle bombardments of Zr, Mo, In, Sm, Gd, and Ta. The half lives as well as the transition energies are reported. (auth)

46718 PROPERTIES OF LEVELS IN ^{121}Sb AND ^{123}Sb EXCITED WITH THE REACTIONS (^{3}He,d), (d,d′) AND (^{16}O,$^{16}O'\gamma$). Barnes, P. D.; Ellegaard, C.; Herskind, B.; Joshi, M. C. (Univ. of Copenhagen). Phys. Lett., 23: 266-9(Oct. 24, 1966).

The two stable isotopes ^{121}Sb and ^{123}Sb were studied with the (^{3}He,d), (d,d′), and (^{16}O,$^{16}O'\gamma$) reactions. An analysis of the results suggests a significant coupling between the odd proton and the core. (auth)

46719 A NEW NUCLIDE: 115-SEC ^{46}K. Parsa, B.; Gordon, G. E. (Massachusetts Inst. of Tech., Cambridge). Phys. Lett., 23: 269-71(Oct. 24, 1966). (MIT-905-69).

A new nuclide, 115-sec ^{46}K, produced by $^{48}Ca(d,\alpha)$, was discovered, and the scheme of ^{46}Ca levels populated by its β and γ decay was constructed. (auth)

46720 STATIC QUADRUPOLE MOMENT OF THE FIRST 2^+ STATE OF VIBRATIONAL NUCLEI. Tamura, Taro (Oak Ridge National Lab., Tenn.); Udagawa, Takeshi. Phys. Rev., 150: 783-90(Oct. 21, 1966). (ORNL-P-2283).

It is shown that reasonable models of vibrational nuclei can be constructed that explain the large magnitude of the static quadrupole moment Q_2 of the first excited 2^+ state of ^{114}Cd, recently derived from the analyses of the Coulomb-excitation experiments. Since the models considered are kept in very simplified forms, in order to make their qualitative implications as transparent as possible, they do not necessarily explain all the other known properties in this nucleus. Nevertheless, it seems that there is room for improving these models while still predicting large Q_2, and thus it is concluded that one can continue to consider ^{114}Cd as a vibrational nucleus, and not a rotational nucleus, in spite of the large magnitude of Q_2. (auth)

46721 ANGULAR DISTRIBUTION FROM HIGH-SPIN STATES, DETERMINED ACCORDING TO THE COLLECTIVE MODEL. Sperber, Daniel (Illinois Inst. of Tech., Chicago). Phys. Rev., 150: 791-3(Oct. 21, 1966). (IITRI-578-P25-16).

The angular distribution from high spins produced in heavy-ion bombardment was calculated for highly deformed nuclei. A method of using this angular distribution as a tool for analyzing the nature of high-spin states is demonstrated. (auth)

46722 SMOOTH VELOCITY-DEPENDENT POTENTIAL AND NUCLEAR MATTER. Tabakin, Frank (Univ. of Pittsburgh); Davies, K. T. R. Phys. Rev., 150: 793-800 (Oct. 21, 1966). (ORNL-P-2334).

A velocity-dependent potential of the form $V(r,p) = -V_1(r) + p^2e^{-s^2p^2}V_2(r) + V_2(r)p^2e^{-s^2p^2}$, where $V_1(r)$ and $V_2(r)$ are Gaussians, is used to fit the singlet (0–320-Mev) phase shifts for elastic nucleon-nucleon scattering. This exponential velocity dependence replaces the hard core with a short-range repulsion which is much softer than the case of quadratic (s = 0) velocity dependence used by Green and Levinger. The two-body scattering problem is solved in momentum space by numerical summation of the Born series; the $^1S_0$ scattering length is calculated separately by a rapid matrix-inversion method. The applicability of ordinary many-nucleon perturbation theory for this interaction is tested by calculation of the first-order (P_1) and second-order (P_2) potential energy per particle of nuclear matter. A rapid singlet-even convergence rate of $P_2/P_1 = 4.3\%$ at $k_F = 1.5$ F follows as a result of the reduced off-energy-shell matrix elements of this two-body interaction. One also finds qualitative agreement with the singlet-state potential energy per particle obtained by Sprung in their complete nuclear-matter calculation. The harmonic-oscillator matrix elements required for Hartree-Fock calculations of spherical nuclei are evaluated quite simply for this potential. Also, since this potential readily separates into relative x, y, and z coordinates, it is well suited for Hartree-Fock calculations of deformed nuclei. (auth)

46723 n-p TRIPLE SCATTERING PARAMETER R_t AT 203 Mev. Reay, N. W.; Thorndike, E. H.; Spalding, D.; Thomas, A. R. (Univ. of Rochester, N. Y.). Phys. Rev., 150: 801-6(Oct. 21, 1966). (UR-875-132).

The neutron-proton interaction was studied by bombarding deuterons with 203-Mev polarized protons and observing high-energy neutrons recoiling into forward angles. The triple-scattering parameter R_t was measured at neutron laboratory angles between 0 and 20°, using a spin-analyzing scatterer of liquid hydrogen, and detecting charge-exchange scattered protons therefrom. The measurements are related to the free n-p scattering amplitudes by means of an impulse-approximation calculation which includes the s-wave final-state interaction between the incident proton and

the proton in the deuteron. The measured values of R_t are compared with the phase-shift solutions YLAN of Breit and collaborators and with the energy-independent solution of Arndt and MacGregor. Solutions YLAN 0, 1, 2, 2M, and 3 do not agree with the data. Solutions YLAN 3M and 4M and the Arndt-MacGregor solution fit the data quite well. (auth)

46724 ASYMMETRY IN THE (p,n) REACTION ON DEUTERIUM AND CARBON AT 215 Mev. Spalding, D.; Thomas, A. R.; Reay, N. W.; Thorndike, E. H. (Univ. of Rochester, N. Y.). Phys. Rev., 150: 806-10(Oct. 21, 1966). (UR-875-133).

A double-scattering experiment was performed on targets of deuterium and carbon, using 215-Mev, 85% polarized protons as incident particles. The asymmetry of recoil neutrons was measured at laboratory angles between 10 and 35°, using a neutron counter consisting of a polyethylene converter and multi-element scintillation telescope. The deuterium measurements are related to the free n-p polarization parameter by an impulse-approximation calculation. The deuterium results are in good agreement with the predictions of Yale phase-shift solutions 3, 3M, and 4M and the new Livermore solution, and are incompatible with Yale solutions 0, 1, 2, 2M. The asymmetries from carbon agree with free-n-p scattering except at laboratory angles of 10 and 35°, where they are greater in absolute value. The asymmetry from carbon showed the greatest dependence on neutron energy at these angles. (auth)

46725 QUASI FREE SCATTERING OF 160-Mev PROTONS FROM NUCLEI. Wall, N. S.; Roos, P. R. (Massachusetts Inst. of Tech., Cambridge. Univ. of Maryland, College Park). Phys. Rev., 150: 811-20(Oct. 21, 1966).

Using 160-Mev protons and a NaI total-energy scintillation counter, the spectra of outgoing protons from 40 to 160 Mev were measured at angles of 10 to 80° for ^{9}Be, ^{12}C, ^{40}Ca, ^{58}Ni, ^{120}Sn, and ^{209}Bi. The data were interpreted by means of an impulse-approximation calculation. The usual analysis was modified to calculate the scattering from nuclei, for which it is assumed that an extreme shell model is a valid representation. The differential cross section thus calculated can be expressed in terms of the momentum of the struck nucleon. It is found that the shell-model description does not give enough high-momentum components to the nucleon wave functions. This is deduced because the experimental results necessitate high-momentum components to be able to produce high-energy large-angle outgoing protons. (auth)

46726 POLARIZATION OF NEUTRONS FROM THE ^{12}C(d,n)^{13}N REACTION FOR DEUTERON ENERGIES FROM 1.7 TO 2.8 Mev. Meier, M. M.; Schaller, L. A.; Walter, R. L. (Duke Univ., Durham, N. C.). Phys. Rev., 150: 821-5(Oct. 21, 1966).

Six polarization distributions over the angular range from 10 to 135° (lab) were obtained for neutrons produced in the ^{12}C(d,n)^{13}N (G.S.) reaction. The bombarding energy range covered was 1.74 to 2.76 Mev. A spin-precession solenoid and scattering from a helium analyzer were employed in conjunction with improved fast-coincidence circuitry. The polarization is appreciably negative at reaction angles less than 70° (lab) for all energies and ranges from −0.2 to −0.3 at the forward stripping peak. The consistency of this negative polarization with higher energy data is attributable to the predominance of the stripping mechanism over compound-nuclear effects. The reasonably high polarization near the stripping peak leads to a consideration of the reaction's utility as a source of polarized neutrons. (auth)

46727 MEASUREMENT OF THE ^{12}C(d,n)^{13}N CROSS SECTION FOR ENERGIES FROM 3.8 TO 5.0 Mev. Hollandsworth, C. E.; Purser, F. O. Jr.; Sawers, J. R. Jr.; Walter, R. L. (Duke Univ., Durham, N. C.). Phys. Rev., 150: 825-30(Oct. 21, 1966).

Yield curves at 5, 40, 80, 115, and 150° were measured for the ^{12}C(d,n)^{13}N (g.s.) reaction from 3.8 to 4.1 Mev in about 10-kev steps in search for a resonance about 40-kev wide, superimposed on a broader one. The existence of the narrower resonance near 3.91 Mev was suggested by Verba who previously measured and analyzed cross sections for the same reaction. No indication of this resonance was seen in earlier work at this laboratory on the same reaction or in studies of the mirror reaction. The results of the present experiment do not exhibit the structure which would be produced by the proposed 40-kev resonance. Thus, it appears that the calculation of Buck and Satchler concerning changes in polarization around an isolated resonance still is applicable to the 4.0-Mev resonance in the ^{12}C + d reactions. A second experiment was conducted in preparation for a polarization study at higher energies in the reaction. With a 50-kev target, a 5° yield curve was obtained up to 5.0 Mev. Only one broad peak was exhibited in the ^{12}C(d,n)^{13}N (g.s.) reaction between 4.1 and 5.0 Mev. No sizable structure appeared for the reaction ^{12}C(d,n)^{13*}N (2.37 Mev) in the 5° yield. Angular distributions of the neutrons for both reactions were measured at 105-kev intervals. All distributions showed strong stripping patterns. (auth)

46728 POLARIZATION OF NEUTRONS FROM ^{12}C + d FOR DEUTERON ENERGIES FROM 3.9 TO 5 Mev. Morgan, G. L. (Duke Univ., Durham, N. C.); Walter, R. L.; Soltesz, C. S.; Donoghue, T. R. Phys. Rev., 150: 830-5 (Oct. 21, 1966).

Angular distributions of the polarization of neutrons from the ^{12}C(d,n)^{13}N (g.s.) reaction were measured at 200-kev intervals for deuteron energies from 4.2 to 5.0 Mev. The polarimeter consisted of a spin-precession solenoid and a helium-gas scintillator. The polarization distributions were similar in shape to those seen previously in this reaction between 3.5 and 4.0 Mev and to those observed in the mirror reaction ^{12}C(d,p)^{13}C (g.s.) at energies above 6 Mev. Sizable polarizations were observed, the extrema of which were −0.57 at 55° (lab) and +0.64 at 130° (lab). In addition, polarization distributions were measured at 3.9 and 4.1 Mev using a thin target. The ^{12}C(d,n) reaction exhibits a resonance near 4.0 Mev, and these measurements, together with earlier measurements at 3.8 and 4.0 Mev, show that the effect of an isolated resonance on the polarization produced in a reaction which proceeds primarily via a direct mechanism is not large. Angular distributions of the polarization of the neutrons from the reaction ^{12}C(d,n)^{13}N (2.37 Mev) were also determined at 4.6 and 5.0 Mev. Since the differential cross section for this group indicates that this reaction proceeds through an $l_p = 0$ angular momentum transfer, these measurements will give additional information about the spin-dependent distorting potentials involved in the interaction. Extrema in the polarization for $E_d = 5.0$ Mev were +0.3 at 40° (lab) and −0.2 at 100° (lab). (auth)

46729 MAGNETIC ANALYSIS OF THE ^{6}Li(^{3}He,t)^{6}Be REACTION. Whaling, Ward (California Inst. of Tech., Pasadena). Phys. Rev., 150: 836-8(Oct. 21, 1966).

The triton spectrum from the reaction ^{6}Li(^{3}He,t)^{6}Be was measured using a 61-cm double-focusing magnetic spectrometer at ^{3}He bombarding energies of 10, 11, and 12 Mev, and at observation angles of 1.7 and 10°. A triton group corresponding to the ^{6}Be ground-state transition was seen. The Q value for the ground-state transition is (−4.306 ± 0.006) Mev, leading to a ^{6}Be−^{6}Li mass difference of 4.288 ± 0.006 Mev, in good agreement with the values from the ^{6}Li(p,n)-^{6}Be threshold. The width of the ground state of ^{6}Be is 89 ± 6 kev. (auth)

46730 p-WAVE THEORY OF THREE-NUCLEON STATES. Mitra, A. N. (Delhi Univ.). Phys. Rev., 150: 839-46(Oct. 21, 1966).

A formalism is developed for the structure of a three-fermion system through p-wave interactions in all pairs. It is mainly designed for the analysis of three-nucleon systems of highest seniority, in particular the tri-neutron, which has been the subject of experimental interest in recent times. The basic (p-wave) interaction is taken to be the separable type, as an extension of the formalism for previous three-body investigations with s-wave interactions in pairs. A detailed classification of the various three-body states involved is given in the (LSJ) coupling scheme.

A generous application of the permutation group for three objects separately in the spin and spatial degrees of freedom dispenses with the need for formal use of fractional parentage coefficients in the construction of various states. The allowed structures of the different wave functions compatible with the assumption of factorable interactions are written down in terms of one-dimensional "spectator functions" for both even and odd parity cases and their integral equations are obtained. The effect of a p-wave spin-orbit force on the mixing of possible three-body states of given J is analyzed and, in a reasonable approximation, shown to be expressible in terms of a simple modification of the strength parameter of the two-body interaction in the integral equations for the spectator functions. The state of strongest attraction is found to be $(1\ ^3/_2\ ^1/_2)^+$, and offers the best chances, for a bound trineutron state. The states of odd parity are found to be much less attractive than, and hence not of as much interest as, those of even parity for three-nucleon systems. It is suggested that those could be of greater interest in a possible quark model of baryon resonances with p-wave forces, to which the present formalism can be mathematically adapted, assuming its physical validity. (auth)

46731 SCREENING CORRECTIONS TO THE FERMI FUNCTION FOR ALLOWED β DECAY. Matese, J. J.; Johnson, W. R. (Univ. of Notre Dame, Ind.). Phys. Rev., 150: 846-51(Oct. 21, 1966). (COO-427-54)

The influence of electron screening on the Fermi function F(W,Z) for allowed β decay is reconsidered. Numerical values for F(W,Z) are obtained by integrating the radial Dirac equations for the decay electrons (positrons) in a self-consistent atomic potential. Relativistic Hartree-Fock-Slater equations are used to construct the atomic potential. The Fermi function is tabulated for various nuclei and energies, and comparisons are made with F(W,Z) for a pure Coulomb field. Detailed comparisons are also made with the WKB screening formula of Rose as well as with the previous numerical results of Reitz and of Bühring. It is found that the Rose formula provides an accurate approximation to F(W,Z) over the dominant portion of the β spectrum provided the endpoint energy is sufficiently high and provided further that an appropriate value of the potential at the nucleus V_0 is used. An empirical formula for V_0 from the Hartree-Fock-Slater calculations is provided. The numerical results of Reitz appear to be badly in error, especially for large electron momenta. The predictions of Bühring for a screened-potential model are in good agreement with the present work. Corrections to the ft value of several superallowed Fermi transitions are recomputed and found to be negligibly different from the predictions made using the Rose approximation. (auth)

46732 ^{7}Be(p,γ)^{8}B REACTION. Parker, P. D. (Brookhaven National Lab., Upton, N. Y.). Phys. Rev., 150: 851-6(Oct. 21, 1966). (BNL-10255).

Absolute cross sections for the ^{7}Be(p,γ)^{8}B reaction were measured at 8 proton energies between 483 and 1932 kev. These measurements were used to obtain a zero-energy intercept of the cross-section factor S(E) for this reaction, $S_0 = 0.043 \pm 0.004$ kev barn. A resonance was observed in the ^{7}Be(p,γ)^{8}B reaction, corresponding to the first excited state of ^{8}B, and a radiative width of 0.050 ± 0.025 ev was obtained for this state. (auth)

46733 STUDIES OF ISOMERIC YIELD RATIOS IN THE PRODUCTION OF ^{44}Sc, ^{52}Mn, AND ^{87}Y BY PHOTONUCLEAR REACTIONS. Walters, William B.; Hummel, John P. (Univ. of Illinois, Urbana). Contract NONR 1834(05). Phys. Rev., 150: 867-76(Oct. 21, 1966).

Isomeric yield ratios for the production of the ^{44}Sc, ^{52}Mn, and ^{87}Y isomers were measured in photonuclear reactions. Scandium, iron, manganese, cobalt, yttrium, and niobium targets were used, and they were irradiated with bremsstrahlung of maximum energy in the 100- to 300-Mev range. The observed isomeric yield ratios show a general favoring of the isomer whose spin is closer to that of the target nucleus. In those cases in which several different bremsstrahlung energies were used, there were no significant variations in the observed isomeric yield ratios with changes in the bremsstrahlung maximum energy. The observed isomeric yield ratios are compared with theoretical isomer ratios calculated on the basis of a compound-nucleus mechanism using the statistical-model formulation of Huizenga and Vandenbosch. The observed isomeric yield ratios can be reproduced by using the same values for the level-density spin-cutoff parameter that are required to account for the isomer ratios that have been observed for particle-induced reactions producing the same isomeric pairs. The required spin-cutoff parameters are reduced by 10 and 20% from those expected for a rigid body in the cases of ^{44}Sc and ^{87}Y. For ^{52}Mn the required value is about 50% larger than the rigid-body value. The result for ^{52}Mn is unusual and may be due to shell structure effects which are not included in the statistical model that was used as a basis for the calculations. (auth)

46734 ^{58}Ni(p,p')^{58}Ni REACTION IN THE 9.1- TO 9.55-Mev RANGE. Swenson, L. W.; Mohindra, R. K. (Franklin Inst., Swarthmore, Pa.). Phys. Rev., 150: 877-86 (Oct. 21, 1966).

A detailed study of the ^{58}Ni(p,p')^{58}Ni reaction was made in the 9.10- to 9.55-Mev incident-proton energy range. Angular distributions of ten resolved excited states below 4.2 Mev were measured at 25-kev energy intervals. The energy-averaged angular distributions were compared with Hauser-Feshbach predictions, and spins are suggested for several levels of ^{58}Ni. Broad structure observed in the yield from the excitation of the 1.456-Mev state is discussed in terms of recently developed intermediate-resonance models. (auth)

46735 DECAY OF A NEW ISOTOPE: ^{69}Cu. Van Klinken, J.; Bureau, A. J.; Eakins, G. W.; Hanson, R. J. (Ames Lab., Ames, Iowa). Phys. Rev., 150: 886-93 (Oct. 21, 1966). (IS-1330).

Sources of ^{69}Cu were produced by γ-p reactions in Zn (enriched to 78.3% ^{70}Zn), and their decay was studied with scintillation and semiconductor detectors. The half life of ^{69}Cu was determined to be 3.0 ± 0.1 min. Seventy-nine percent of the decay is by direct beta decay to the ground state of ^{69}Zn ($E_0 = 2.48 \pm 0.07$ Mev, log ft = 5.1). The remaining decay modes exhibit a complex spectrum for which a level scheme was established. The proposed ^{69}Zn levels that are fed by the ^{69}Cu decay are at 0.5307, 0.8340, 1.0065, 1.1795, 1.428, 1.825, and 2.026 Mev. Other suggested but more tentative levels are at 0.615, 2.17, and 2.4 Mev. Of the beta-decay modes, those to the 0.5307- and 0.615-Mev levels have the highest log ft values, namely ~6.7 and 6.8, respectively. The log ft values of the other branches are smaller than 5.7 and all indicate allowed beta decay. (auth)

46736 STUDY OF THE ^{59}Co(n,γ)^{60}Co REACTION AND THE LEVEL STRUCTURE OF ^{60}Co. Shera, E. Brooks; Hazemeister, D. W. (Los Alamos Scientific Lab., N. Mex.). Phys. Rev., 150: 894-905(Oct. 21, 1966). (LA-DC-7932).

The level structure of the odd-odd ^{60}Co nucleus was studied using the thermal-neutron capture reaction ^{59}Co(n,γ)^{60}Co. The gamma spectrum from this reaction in the energy intervals 50–1850 kev and 4500–7500 kev was studied with a Li-drifted Ge spectrometer system. A number of new transitions are reported. The observed levels are compared with those excited by the ^{59}Co(d,p) reaction. Gamma-gamma coincidence measurements using Ge(Li) and NaI detectors were made, which provide considerable information about the low-energy-level structure. In these measurements a primary high-energy transition, selected by the Ge(Li) detectors, defines a particular low-lying level. The decay of this level, isolated by the coincidence requirement from extraneous background, is observed with a NaI detector. Spins and parities of the excited states below about 1 Mev are deduced from the observed gamma branches. The low-lying excited states are interpreted in terms of the $\pi(f_{7/2})^{-1}\nu(p_{3/2})^{-1}$, $\pi(f_{7/2})^{-1}\nu(f_{5/2})^1$, and $\pi(f_{7/2})^{-1}\nu(p_{1/2})^1$ proton-neutron configurations. The spectra of these configurations, calculated using a zero-range central force for the residual interaction, are compared with the observed levels. (auth)

46737 STUDY OF THE SECOND 2^+ STATE IN ^{42}Ca, ^{44}Ca, AND ^{48}Ti. Matin, S. M.; Church, D. J.; Mitchell, G. E. (Columbia Univ., New York). Phys. Rev., 150: 906-12(Oct. 21, 1966).

The third excited state of ^{42}Ca (at 2.42 Mev), the fourth excited state of ^{44}Ca (at 2.66 Mev), and the third excited state of ^{48}Ti (at 2.42 Mev) were studied. The experimental method used to study these states was that of gamma-gamma angular correlations from aligned nuclei produced by nuclear reactions (method I of Litherland and Ferguson). Previous experiments suggested a spin assignment of 2^+ for these states; the present results confirm this assignment. The E2/M1 multipole mixing ratios for the $2_2^+ \rightarrow 2_1^+$ transitions are as follows: ^{42}Ca($\delta = +0.20 \pm 0.10$), ^{44}Ca($\delta = +0.14 \pm 0.07$), and ^{48}Ti($\delta = -0.18 \pm 0.09$). (auth)

46738 ^{40}Ar(p,p′γ) REACTION MECHANISM AT LOW ENERGIES. Hulubei, H.; Berinde, A.; Scintei, N.; Martalogu, N.; Neamu, I.; Teodorescu, C. M. (Inst. for Atomic Physics, Bucharest). Phys. Rev., 150: 912-18(Oct. 21, 1966).

The angular distributions of the protons inelastically scattered on ^{40}Ar at 4.1 and 7.3 Mev were measured with semiconductor detectors. The angular distribution at E_p = 4.1 Mev, corresponding to the first excited state Q = –1.46 Mev of ^{40}Ar, and the angular distributions at E_p = 7.3 Mev on the higher excited states of the target are well explained by the statistical model of the compound nucleus with the inclusion of the (p,n) outgoing channels in the calculation. The angular distribution at E_p = 7.3 Mev on the first excited state of ^{40}Ar shows a forward peak characteristic of the direct-interaction mechanism. The part taken by the direct interaction in the excitation of the first level of ^{40}Ar is confirmed by the (p,$p_1\gamma$) angular correlations measured at E_p = 5.8 Mev. An attempt is made to separate the contributions of the two reaction mechanisms to the excitation of the first excited state of ^{40}Ar, in the 3 to 17 Mev bombardment-energy range. The spins for some levels of ^{40}Ar are also suggested. (auth)

46739 LEVEL SPECTRA OF ODD-EVEN $1f_{\frac{7}{2}}$-SHELL NUCLEI IN THE CORIOLIS COUPLING MODEL. Malik, F. B.; Scholz, W. (Yale Univ., New Haven). Phys. Rev., 150: 919-32(Oct. 21, 1966).

The negative parity levels of odd-even nuclei with protons and neutrons in the $1f_{\frac{7}{2}}$ shell are calculated using the strong-coupling symmetric-rotator model including the Coriolis coupling between bands. The single-particle energy levels and wave functions in the deformed well are calculated for a spin-orbit strength $C = -0.26\hbar\omega_0$ which is consistent with the observed splitting in ^{41}Ca. Energy levels and wave functions are calculated as a function of the deformation parameter β; the level spectrum for each individual nucleus is given for a tentative choice of β. The effect of a quenching of the Coriolis interaction on the calculated level spectrum is investigated. The calculated level spectra for the nuclei ^{43}Sc, ^{45}Sc, ^{47}Sc, ^{43}Ca, ^{45}Ti, ^{47}V, ^{49}V, ^{51}V, ^{45}Ca, ^{47}Ti, ^{49}Cr, ^{51}Mn, ^{53}Mn, ^{49}Ti, and ^{51}Cr compare favorably with experiment. The model predicts the correct ground-state spin for all nuclei, including the anomalous cases of ^{47}Ti, ^{49}Cr, and ^{51}Mn which have a $\frac{5}{2}^-$ ground state. Thus the observed $\frac{7}{2}^-$ (and occasionally $\frac{5}{2}^-$) ground-state configuration cannot be adduced as evidence supporting the validity of the spherical-shell model in the $1f_{\frac{7}{2}}$ shell. The positions of negative parity states with known spin—especially the low-lying $\frac{3}{2}^-$ states—are well accounted for in this model, in contrast with difficulties encountered in the shell-model treatment. In particular, the model reproduces the observed ground-state triplets in ^{47}V and in ^{49}V and the low-lying $\frac{3}{2}^-$ state in ^{51}Cr. Further, this model predicts the correct number of levels below about 2.5-Mev excitation energy for nuclei in the upper half of the $1f_{\frac{7}{2}}$ shell. For nuclei in the lower half of the $1f_{\frac{7}{2}}$ shell, more levels are observed than predicted, which suggests the presence of positive parity states arising from core excitation of the 2s-1d shell. The natural classification of the $1f_{\frac{7}{2}}$ nuclei in this model according to their odd-nucleon count is borne out by the similarity of the observed spectra. The natural shell-model classification scheme in terms of the conjugate and equivalent pairs, on the other hand, does not seem to be supported by the experimental data. (auth)

46740 NUCLEAR MAGNETIC MOMENT AND HYPERFINE-STRUCTURE ANOMALY OF ^{24}Na. Chan, Yau W. (Brookhaven National Lab., Upton, N. Y.); Cohen, Victor W.; Lipsicas, Max; Silsbee, H. B. Phys. Rev., 150: 933-5 (Oct. 21, 1966). (BNL-10170).

The nuclear magnetic dipole moment and the hyperfine structure of ^{24}Na were studied using a high-precision atomic-beam resonance method to give μ_I = 1.6902(5) nm (corrected for atomic diamagnetism) and $\Delta\nu$ = 1,139,332,580 (100) Hz. The hyperfine-structure anomaly of ^{24}Na is given by $_{23}\Delta_{24}$ = +0.00002(30). (auth)

46741 INELASTIC PROTON SCATTERING ON THE ISOTOPES ^{62}Ni, ^{64}Ni, ^{63}Cu, AND ^{65}Cu AT 17.5 Mev. McCarthy, A. L.; Crawley, G. M. (Princeton Univ., N. J.). Phys. Rev., 150: 935-40(Oct. 21, 1966). (PUC-937-205).

The nuclei ^{62}Ni, ^{64}Ni, ^{63}Cu, and ^{65}Cu were studied by means of the inelastic scattering of 17.5-Mev protons. The total energy resolution of about 40 kev in this experiment enabled many closely spaced states to be resolved. Transition strengths were extracted for the strongly excited states using the distorted-wave Born approximation, and the results were compared with the weak-coupling model of odd-A nuclei. (auth)

46742 DECAY OF ^{55}Co: LEVELS IN ^{55}Fe. Fischbeck, H. J.; Porter, F. T.; Freedman, M. S.; Wagner, F. Jr.; Bolotin, H. H. (Argonne National Lab., Ill.). Phys. Rev., 150: 941-55(Oct. 21, 1966).

The decay of 18-hr ^{55}Co → ^{55}Fe was re-examined with a magnetic beta spectrometer and a Ge(Li) detector. It was established that both the 1316.4- and 411.4-kev levels are populated in the gamma cascades. Positron emission and electron capture populate the 1408.4-kev level (36%), the 1316.4-kev level (5%), and the 931.2-kev level (54%). The remaining 5% of the decay populates seven levels above 1408 kev. Positron decay to the 411-kev level and to the ground state in sum is $< 3 \times 10^{-5}$ per disintegration. From the endpoint of the maximum-energy positron group, E_0 = 1513 ± 2 kev, feeding the 931.2-kev gamma ground-state transition, the total decay energy is found to be 3466 ± 2 kev. The decay scheme requires only levels already known in ^{55}Fe from nuclear reaction studies. A survey of the reaction data and the decay information reveals that the only conflict is the assignment of l = 4 (from some of the ^{54}Fe(d,p)^{55}Fe studies) to the level at 2589 kev. (auth)

46743 ANALYSIS OF γ-γ CASCADES BY POLARIZATION AND DIRECTIONAL CORRELATION: DECAY OF ^{101g}Rh. Wood, G. T. (Univ. of Pennsylvania, Philadelphia. Argonne National Lab., Ill.); Koicki, S.; Koicki, A. Phys. Rev., 150: 956-63(Oct. 21, 1966).

A procedure is given for using the results of polarization-direction correlation and directional-correlation measurements to analyze γ-γ cascades in cases in which both transitions may be of mixed multipole order. A method is also presented for obtaining polarization-direction correlation coefficients from the measured rates via a Monte Carlo program based on Compton-scattering theory. The methods were applied to the 198–127 kev γ-γ cascade in ^{101}Ru populated by the decay of ^{101g}Rh. It was determined that the spin of the 127-kev state is $\frac{3}{2}$ and the spin of the 325-kev state is $\frac{1}{2}^+$. The E2/M1 mixing ratio is 0.17 ± 0.04 for the 127-kev transition and –0.12 ± 0.03 for the 198-kev transition. Relative γ intensities of 94, 100, and 21, respectively, were found for the 127-, 198-, and 325-kev transitions. In a triple-coincidence scintillation-counter measurement, the K internal-conversion coefficient of the 127-kev transition was found to be 0.16 ± 0.02. (auth)

46744 GAMMA-RAY SPECTRUM FROM THERMAL-NEUTRON CAPTURE IN ^{149}Sm, AND ASSOCIATED ENERGY LEVELS IN ^{150}Sm. Smither, R. K. (Argonne National Lab., Ill.). Phys. Rev., 150: 964-84(Oct. 21, 1966).

The gamma spectrum resulting from thermal-neutron capture in ^{149}Sm was investigated using a 7.7-m bent-crystal spectrometer. The observed spectrum consisted of 217

gamma rays with energies between 40 kev and 2.4 Mev. The bent-crystal gamma-ray data were combined with the conversion-electron data of Bieber and of Groshev to obtain K conversion coefficients for fifty of the observed gamma transitions. These precise measurements of gamma energies, intensities, and conversion coefficients were combined with a set of γ-γ coincidence and γ-γ angular-correlation measurements [with a similar source of $^{149}Sm(n,\gamma)^{150}Sm$ gamma rays] to develop a partial level scheme for ^{150}Sm. In this partial level scheme, the spin and parity assignments for all 14 levels are uniquely defined. The energy levels at 1279.05, 1449.15, and 1504.42 kev are of particular interest because they exhibit strong E2 transitions to the 4^+ state at 773.51 kev and indicate the presence of strong collective components in their wave functions. The previously published decay, (n,γ), and charged-particle work on ^{150}Sm were then combined with the crystal diffraction data to define twelve additional levels in ^{150}Sm. This extended level scheme of ^{150}Sm agrees well with much of the previously published work and removes many of the previous uncertainties in the level scheme. (auth)

46745 LEVELS OF ^{149}Pm FROM THE DECAY OF ^{149}Nd. Gopinathan, K. P.; Singru, R. M. (Tata Inst. of Fundamental Research, Bombay). Phys. Rev., 150: 985-95(Oct. 21, 1966).

The decay of ^{149}Nd was investigated by means of a double-focusing beta spectrometer, a Ge(Li) gamma spectrometer, and scintillation spectrometers. The following multipolarities were assigned to the gamma transitions in ^{149}Pm on the basis of internal-conversion measurements: 114 kev (M1 + E2), 156 kev (E1), 189 kev (M1 + E2), 211 kev (M1 + <20% E2), 240 kev (M2), 268 kev (M1 + <30% E2), 270 kev (E1), and 327 kev (E1). The gamma spectra studied in a well-type 3-in. × 3-in. NaI(Tl) crystal as well as a Ge(Li) detector showed high-energy transitions up to 1540 kev. Gamma-gamma coincidence measurements and delayed-gating technique established energy levels in ^{149}Pm at 114, 189, 211, 240, 270, 397, 538, 654, 767, and 966 kev. Other possible high energy levels weakly populated from the decay of ^{149}Nd are discussed. A combined analysis of the earlier gamma-gamma directional correlation measurements and the present internal-conversion measurements lead to the following spin and parity assignments to the low-lying energy levels of ^{149}Pm: 114 kev ($5/2^+$), 211 kev ($5/2^+$), 240 kev ($11/2^-$), 270 kev ($7/2^-$), and 538 kev ($5/2^-$). (auth)

46746 EFFECT OF NUCLEAR ALIGNMENT ON THE 14-Mev TOTAL NEUTRON CROSS SECTION OF ^{165}Ho. Marshak, H. (National Bureau of Standards, Washington, D. C.); Richardson, A. C. B.; Tamura, T. Phys. Rev., 150: 996-1010(Oct. 21, 1966). (ORNL-P-2098).

The effect of nuclear alignment on the total cross section of the highly deformed ^{165}Ho nucleus was measured using 14-Mev neutrons. The aligned ^{165}Ho target was obtained by cooling a metal single crystal to 0.33°K. A finely collimated beam of 14-Mev neutrons was produced by careful collimation of the alpha particle produced in the $^3H(d,n)^4He$ reaction and by detecting it in fast coincidence with its associated neutron. The measured total cross section is 5.29 ± 0.10 b. The fractional change in the total cross section, for a nuclear alignment $f_2 = 0.31$, is + 3.52 ± 0.75%, where the positive sign indicates a larger cross section for nuclei aligned perpendicular to the incident beam than for randomly oriented nuclei. These results are in excellent agreement with the predictions of the optical model using an adiabatic coupled-channel calculation. The optical-model parameters used are in good agreement with those obtained from other measurements, and in particular the value of the deformation parameter $\beta = +0.30$ is the same as that used in previous work. It was also found that 14 Mev is not yet a sufficiently high energy to use the black-nucleus model to interpret the results. (auth)

46747 STATES OF ^{97}Mo. Ajzenberg-Selove, F. (Haverford Coll., Pa.); Maxman, S. H. Phys. Rev., 150: 1011-12(Oct. 21, 1966).

The $^{96}Mo(d,p)^{97}Mo$ reaction was studied using 12-Mev deuterons and thin separated ^{96}Mo layers deposited on carbon backings. The proton spectra were determined with a broad-range Browne-Buechner spectrograph. Seventeen states of ^{97}Mo with $E_x \lesssim 2.6$ Mev were identified. (auth)

46748 BETA-GAMMA DIRECTIONAL CORRELATION IN ^{125}Sb. DuBard, James L.; Wyly, L. D. Jr.; Braden, Charles H. (Georgia Inst. of Tech., Atlanta). Phys. Rev., 150: 1013-17(Oct. 21, 1966).

The directional correlation of the first-forbidden 0.437-Mev beta group and the 0.176-Mev gamma ray in the decay of ^{125}Sb was measured at four beta energies between 0.255 and 0.405 Mev. A large anisotropic gamma-gamma coincidence background was eliminated by increasing the distance from source to beta detector while focusing the beta rays with a pair of quadrupole magnets. The beta-energy dependence of the directional correlation indicates a spin assignment of $9/2$ for the 0.321-Mev state in ^{125}Te. Analysis of the relative magnitudes of the principal nuclear matrix elements gives possible values for parameter Λ in agreement with the prediction 2.34 based on the conserved-vector-current theory. (auth)

46749 CALCULATIONS OF THE ENERGY AND MASS YIELDS FROM THE THERMAL-NEUTRON FISSION OF ^{236}U. Ferguson, J. M.; Read, P. A. (Naval Radiological Defense Lab., San Francisco). Phys. Rev., 150: 1018-26 (Oct. 21, 1966).

Improvements in a semiempirical correlation of the energy and mass yield data for ^{236}U fission are presented. The available mass, energy, and neutron-emission data are correlated with each other within the accuracy of the input data. A simple model of the ^{236}U fragments at scission is presented. This model, together with some experimental data, is used to predict the surface-tension parameters of the fragments and kinetic energies of the fragment pairs. The calculated kinetic energies agree reasonably well with experiment. The surface-tension parameters of the fragments show strong shell effects, as indicated in other studies. The shapes of the fragments at scission are estimated from the model. (auth)

46750 RANGES AND KINETIC ENERGIES OF FRAGMENTS FROM FISSION OF ^{238}U INDUCED BY 14.5-Mev NEUTRONS. Desai, R. D.; Menon, M. P. (Texas A and M Univ., College Station). Phys. Rev., 150: 1027-32 (Oct. 21, 1966).

The average ranges of eight fission-product recoils in uranium, including both symmetric and asymmetric fragments, were measured radiochemically from 14.5-Mev-neutron-induced fission of ^{238}U, using the thick-target technique. The measured average ranges, corrected for anisotropy, scattering, and edge effects, are, in mg/cm^2 U : ^{91}Sr : 10.21 ± 0.42, ^{99}Mo : 11.20 ± 0.29, ^{113}Ag : 9.63 ± 0.33, ^{115}Cd : 9.90 ± 0.97, ^{117}Cd : 9.36 ± 0.45, ^{121}Sn : 9.47 ± 0.87, ^{139}Ba : 7.60 ± 0.14, and ^{140}Ba : 8.14 ± 0.28. Using Niday's range-velocity relation, these ranges were converted to kinetic energies of the fragments to determine if there exists a deficit in total kinetic energy release at symmetric mass division. A dip was observed in the range-versus-mass curve, but the magnitude of this dip was smaller than what was previously reported in thermal-neutron fission of ^{235}U. The maximum total kinetic energy release at mass ratio 1.36 was found to be 176.7 ± 3.3 Mev, and the deficit in the energy release, corresponding to the observed dip in the range-mass curve, at symmetric fission was estimated to be 17 ± 5 Mev. (auth)

46751 LEVELS IN ^{149}Sm FROM THE DECAY OF ^{149}Eu AND ^{149}Pm. McIsaac, L. D.; Helmer, R. G. (Phillips Petroleum Co., Idaho Falls, Idaho). Phys. Rev., 150: 1033-?(Oct. 21, 1966).

The levels in ^{149}Sm were studied by means of the decay of ^{149}Pm and ^{149}Eu. Sources of these isotopes were obtained from the decay of the parents ^{149}Nd and ^{149}Gd. Gamma spectra were measured with NaI(Tl) and Ge(Li) spectrometers, and electron spectra were determined with a surface-barrier silicon detector. Gamma-gamma coincidence spectra were obtained with NaI(Tl) and Ge(Li) detectors in conjunction with a multiparameter analyzer. Decay schemes are proposed which have levels in ^{149}Sm at 22.5, 277.0,

285.9, 350.0, 528.5, 558.4, 590.9, 636.4, 830.4, 833.2, and 881.9 kev. Fourteen gamma transitions are observed in the decay of ^{149}Eu, and twenty-five gamma transitions are observed in that of ^{149}Pm. All of these transitions fit into the proposed level structure. Multipolarities are assigned from conversion-coefficient data for transitions of 254 (M1), 277 (M1), 327 (M1 + E2), 350 (E2), 505 (E2), 528 (E2), 535 (E2), and 558 kev (E2). (auth)

46752 NEW DEUTERON-STRIPPING THEORY. Clement, C. F. (Atomic Energy Research Establishment, Harwell, Eng.). Phys. Rev. Lett., 17: 759-61(Oct. 3, 1966).

It is shown that the basic sudden approximation of the Butler-Tanifuji theory of deuteron stripping is invalid and should result in a zero direct-reaction matrix element. (D.C.W.)

46753 THRESHOLD PHOTONEUTRON CROSS SECTIONS FOR IRON AND BISMUTH. Berman, B. L.; Sidhu, G. S.; Bowman, C. D. (Univ. of California, Livermore). Contract W-7405-eng-48. Phys. Rev. Lett., 17: 761-4 (Oct. 3, 1966). (UCRL-14927).

Photoneutron cross sections were measured for iron and bismuth for photon energies up to 15 kev above threshold by the neutron time-of-flight technique. A number of nuclear levels were observed. Nuclear properties which can be derived from the data include ground-state gamma transition widths, gamma strength functions, and average level spacings. (auth)

46754 $_{\Lambda\Lambda}{}^{6}$He DOUBLE HYPERFRAGMENT. Prowse, D. J. (Univ. of Wyoming, Laramie. Univ. of California, Los Angeles). Phys. Rev. Lett., 17: 782-5(Oct. 3, 1966).

An event was found in an emulsion stack exposed to mesons (K^-) at 4 to 5 Bev which appears to be consistent with the production and decay of a $_{\Lambda\Lambda}{}^{6}$He double hyperfragment. It was confirmed that double hyperfragments exist and that the value of the low-energy Λ-Λ interaction (binding) is about 4.6 ± 0.5 Mev. (D.C.W.)

46755 NUCLEI OF LOW TO MEDIUM MASS. Harris, Gale I.; Goldhammer, Paul. Phys. Today, 19: No. 10, 62-7 (Oct. 1966).

Some recent experimental and theoretical observations on the structure of nuclei with $16 \leq A \leq 56$ are discussed, including techniques for studying nuclear structure. (D.C.W.)

46756 GROUND STATE HINDRANCE FACTORS FOR ODD-EVEN NUCLEI. Voeroes, T. (Univ. for Technical Sciences, Budapest). Physica, 32: 1173-6(June 1966).

It is shown that the ground state hindrance factors for odd-even nuclei of Fr, Pa, Np, and Am have a minimum as a function of neutron number. An attempt is made to explain this fact within the scope of Tolhoek's and Brussaard's theory. (auth)

46757 ON THE DECAY OF ^{77}As. Ythier, C.; Renucci, G.; Huguet, M.; Ardisson, G.; Grassi, H.; Maria, H.; Dalmasso, J. (Univ., Paris, Nice). Physica, 32: 1350-4 (July 1966). (In French).

Gamma rays with energies (kev) and relative intensities (%) of 87.7(16.1), 162.0(19.1), 238.8(100), 249.5(22.5), 271.1(0.5), 281.9(3.5), and 520.74 kev (24.9%) were observed in the decay of ^{77}As using a semiconductor spectrometer. The decay of ^{77}As takes place partly through two levels of ^{77}Se located at 238.8 and 249.5 kev. A decay scheme for ^{77}As is proposed. (D.C.W.)

46758 THREE EXAMPLES OF $_{\Lambda}$Be^{7} HYPERFRAGMENTS. Chaudhari, K. N.; Ganguli, S. N.; Rao, N. K.; Swami, M. S. (Tata Inst. of Fundamental Research, Bombay). Proc. Indian Acad. Sci., Sect. A, 64: 51-6(July 1966).

Three events involving the decay of $_{\Lambda}$Be^{7} were observed, including one meson(π^-) decay and two nonmesic decays. The binding energy of Λ^0 relative to the lowest level of ^{6}Be was determined to be 4.99 ± 0.36 Mev. (D.C.W.)

46759 THE ^{72}Ge(n,p)^{72}Ga AND THE ^{72}Ge(n,α)^{69m}Zn REACTOR CROSS SECTIONS. INTERFERENCE IN ACTIVATION ANALYSIS OF GALLIUM AND ZINC IN GERMANIUM BY FAST NEUTRON REACTIONS IN THE MATRIX. De Neve, R.; De Soete, D.; Hoste, J. (Ghent Univ.). Radiochim. Acta, 5: 188-92(July 1966).

The reactor cross sections of the ^{72}Ge(n,p)^{72}Ga and the ^{72}Ge(n,α)^{69m}Zn reactions were determined experimentally from the apparent concentrations of ^{72}Ga and ^{69m}Zn measured in an irradiated germanium matrix. A simultaneous and quantitative separation method for these elements from germanium or germanium dioxide was developed, using precipitation with 8-hydroxyquinoline. A decontamination factor of 2.5×10^5 and 7×10^6 for Ge and As was obtained. At a thermal to fast neutron flux ratio of 7.7 the apparent concentrations in germanium dioxide were respectively 0.36 ppM Ga and 11.2 ppM Zn. The values of the cross sections ($\bar{\sigma}$) were 0.044 ± 0.007 mb for the ^{72}Ge(n,p)^{72}Ga reaction and 0.011 ± 0.002 mb for the ^{72}Ge(n,α)^{69m}Zn reaction. (auth)

46760 ALPHA DECAY HALF LIVES OF ^{148}Gd, ^{150}Gd, AND ^{146}Sm. Friedman, A. M.; Milsted, J.; Metta, D.; Henderson, D.; Lerner, J.; Harkness, A. L.; Rokop, D. J. (Argonne National Lab., Ill.). Radiochim. Acta, 5: 192-4(July 1966).

The alpha half lives and energies of ^{148}Gd, ^{150}Gd, and ^{146}Sm were found to be: ^{148}Gd 97.5 ± 6.5 yr and 3.17 ± .02 Mev; ^{150}Gd 1.78 ± (.08) · 10^6 yr and 2.7 ± .10 Mev; ^{146}Sm 1.026 ± (.048) · 10^8 yr and 2.55 ± .03 Mev. The half life of ^{146}Sm was long enough so that it might be as high as 10^{-15} of normal Sm. (auth)

46761 INVESTIGATION OF THE RANGE DISTRIBUTION OF Pu FISSION PRODUCTS WITH THE HELP OF THE STRIPPING METHOD. Hollstein, M.; Muenzel, H. (Kernforschungszentrum, Karlsruhe, Ger.). Radiochim. Acta, 5: 195-202(July 1966). (In German).

The stripping method used for dissolving thin layers from aluminum absorbers was investigated. It was shown that elements considerably more electropositive than aluminum are only partially stripped. Therefore activity is retained by the catcher in investigations of the range distribution of fission products corresponding to those elements. A correction for this effect is possible. The range distribution in aluminum of cumulatively formed ^{140}Ba and ^{127}Sb from the fission of ^{239}Pu by thermal neutrons was studied by means of the stripping method. The mean range and relative range dispersion are, respectively, for ^{140}Ba, 2.95 mg Al/cm^2 and 20.3%, and for ^{127}Sb, 3.6 mg Al/cm^2 and 23.1%. The low-energy component that occurs in the range distribution curves is discussed. (auth)

46762 YIELDS OF FISSION-RECOIL BROMINE BY DELAYED-NEUTRON STUDIES. Silbert, M. D.; Tomlinson, R. H. (McMaster Univ., Hamilton, Ontario). Radiochim. Acta, 5: 223-7(July 1966).

Fission-product bromine was isolated from a uranium target by the hot-atom reaction of the fission recoils with methane to form organic bromides. The delayed-neutron activity of the short-lived bromine isotopes was measured and analyzed to obtain the relative yields of delayed neutrons from ^{87}Br, ^{88}Br, and ^{89}Br. The primary yields of the three isotopes in thermal-neutron fission of ^{233}U and ^{235}U were estimated on the basis of the delayed-neutron yields. (auth)

46763 FISSION TECHNETIUM. [PART] II. Baeckmann, A. v.; Feuerstein, H. (Kernforschungszentrum, Karlsruhe, Ger.). Radiochim. Acta, 5: 234-5(July 1966). (In German).

The gamma spectra of ^{105}Tc, ^{106}Tc, and ^{107}Tc are presented. The technetium isotopes were prepared by fission of ^{239}Pu in the FR-2 reactor. Fission technetium were extracted from fission product solutions for as rapid as possible determination of ^{105}Tc, ^{106}Tc, and ^{107}Tc after the decay of ^{105}Mo, ^{106}Mo, and ^{107}Mo. Relative cumulative fission yields were determined for ^{235}U and ^{239}Pu fission. In an attempt to measure the half lives of ^{108}Tc and ^{109}Tc it was determined that they are shorter than 10 sec. (M.C.G.)

46764 RADIOACTIVITY BUILD-UP IN FRESHLY SEPARATED ^{226}Ra, ^{227}Ac, AND ^{232}U. Stewart, D. C.; Macias, E. S.; Basile, L. J.; Milsted, J. (Argonne National Lab., Ill.). Radiochim. Acta, 5: 237-8(July 1966).

Previously reported data, calculated by computer methods, on the rate at which radioactive daughters are regenerated into freshly purified samples of ^{226}Ra, ^{227}Ac, and ^{232}U are given in the form of graphs. In the case of ^{226}Ra the four alpha emitters (^{222}Rn, ^{218}Po, ^{218}At, and ^{214}Po), and the three beta emitters (^{214}Bi, ^{214}Pb, and ^{210}Tl) of the upper part of the decay chain come to equilibrium in about one month's time. The activity in the balance of the chain is controlled by 22-year ^{210}Po so that the total radioactivity is still increasing at the end of the 50 year time span considered. The chain of daughter activity growth in purified ^{227}Ac is quite complex, but since the longest-lived daughter formed is 18.17-day ^{227}Th, equilibrium is reached relatively rapidly. In the case of ^{232}U, the first daughter formed, 1.9-year ^{228}Th, is longer lived than any of the subsequent products so it controls the radioactivity buildup. The daughters below ^{228}Th come into effective equilibrium with that intermediate within a few months, and the entire system comes to equilibrium with the ^{232}U parent in about a decade. (D.H.M.)

46765 ELASTIC AND INELASTIC SCATTERING OF α PARTICLES ON ^{32}S. Hulubei, H.; Semenescu, G.; Ivascu, I.; Marincu, E.; Dumitrescu, R. (Inst. of Atomic Physics, Bucharest). Rev. Roum. Phys., 11: 329-38(1966). (In French).

The angular distributions of alpha particles scattered elastically and inelastically by ^{32}S at 12.2, 13.5, 14.8, and 16.1 Mev were measured. The distributions have a diffractional nature that disappears or becomes irregular in the backward direction. The behavior of the angular distributions indicates that compound-nucleus formation occurs mainly for the lower energies. An analysis of the inelastic scattering using a diffraction model gave a value of 0.20 for the permanent deformation of ^{32}S. (D.C.W.)

46766 ROTATION-VIBRATION INTERACTION IN DEFORMED NUCLEI. Bes, D. R.; Zuker, A. P. (Univ., Buenos Aires). Rev. Union Mat. Argent. Asoc. Fis., 22: 173-83(1965).

The collective and intrinsic degrees of freedom of nuclei can be mixed through residual terms of the Hamiltonian, such as the Coriolis force and the rotation–vibration interaction. This leads to a mixing of the states belonging to the rotational band of the ground state with those belonging to bands of the vibrational state. It is shown that, in the adiabatic limit, this mixing is the same whether one chooses to consider the vibrations as collective modes or as superposition of intrinsic excitations. (S.F.L.)

46767 FORM FACTORS OF THE THREE-NUCLEON SYSTEMS ^{3}H AND ^{3}He. Radha, T. K. (MATSCIENCE, Madras). pp 103-5 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

In a previous work (G. Derrick and J. M. Blatt, Nuclear Phys., 8: 310(1958)), the possible ground states of the three-nucleon systems ^{3}H and ^{3}He were analyzed, according to which there are three possible $^{2}S_{\frac{1}{2}}$ states: A state (S), fully symmetric in the space coordinates of all three nucleons, which is the dominant state (96% from binding energy calculations); a state that is antisymmetric in the space coordinates of any pair of the three nucleons; and a state (S′) of mixed symmetry. Work is being done on the rate of capture of slow neutrons by deuterium, which can determine the probability of the S′ state. At thermal energies, the transition occurs through the magnetic dipole transition, and the rate of capture depends essentially on the S′-state contribution. The wave function for the continuum n + d is taken to fit the n-d scattering data. The best fit comes from the Gaussian wave function. Taking, therefore, the Gaussian function for the final triton, the transition rate is calculated. The calculations are expected to yield information on the form factors of ^{3}H and ^{3}He. (S.F.L.)

46768 MUON CAPTURE BY COMPLEX NUCLEI. Devanathan, V. (Univ. of Madras). pp 107-15 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

A theoretical analysis of meson (μ) capture by complex nuclei is presented. Numerical results for the partial capture rates to four states of ^{16}N are given. (D.C.W.)

46769 INVESTIGATION OF THE ^{34}S(p,γ)^{35}Cl REACTION. Kopanets, E. G.; Korda, Yu. S.; Koval, A. A.; Sukhotin, L. N.; Tsytko, S. R. Ukr. Fiz. Zh., 11: 929-35(1966). (In Ukrainian).

An investigation was made of the ^{34}S(p,γ)^{35}Cl reaction at excitation energies of the ^{35}Cl nucleus, E_{exc} = 8.407; 8.489 and 8.576 Mev. The spectra and angular distributions of γ-rays were measured. The angular-distribution analysis was carried out with the aid of a Dnieper electronic computer. The χ^2-method was used for comparison of the theoretical and experimental data. A decay scheme of resonance levels is proposed on the basis of an analysis of the experimental data. The spin and parity of these levels are determined as $I^{\pi} = 5/2^{+}$; $I^{\pi} = 5/2^{+}$; $I = (3/2, 5/2)$ at E_{exc} = 8.407, 8.489, and 8.576 Mev respectively. The reduced matrix elements are calculated for some γ-transitions. (auth)

46770 DETERMINATION OF NUCLEAR PARAMETERS FROM THE ANGULAR CORRELATION FOR NUCLEAR E0-TRANSITIONS. Borisoglebskii, L. A. Vestn. Moskov. Univ., Ser. III, Fiz. Astron., No. 1, 24-9(Jan.-Feb. 1966). (In Russian).

Nuclear parameters were determined using the angular and polarization correlations for nuclear E0 transitions. Coefficients of the angular correlation function e-γ were calculated for various 2+ → 2+ → 0 type cascade transitions (for ^{196}Pt, ^{198}Hg, and ^{96}Mo) considering the influence of the surface layer and nuclear deformation on electron factors and on the E0 transitions. (tr-auth)

46771 EFFECTS OF TWO-PARTICLE EXCITATION IN STRIPPING REACTIONS. Zhivopistsev, F. A. Vestn. Moskov. Univ., Ser. III: Fiz. Astron., No. 4, 13-19(July–Aug. 1965). (In Russian).

One possibility for the construction of the stripping theory for (d,p) and (d,n) reactions on light nuclei in the low-energy region is shown. Formulas for the T matrix were obtained without use of the hypothesis of weak interactions and mechanism of nuclear reactions. It is shown that the T matrix can be represented in the form of the sum of two fractions, one of which has a resonant character and corresponds to two-particle excitation of the compound nucleus. An evaluation of the width of the two-particle excitation is given. (tr-auth)

46772 GROSS PROPERTIES OF NUCLEAR β DECAY. Yamada, Masami (Waseda Univ., Tokyo). Waseda Daigaku Rikogaku Kenkyusho Hokoku, No. 3/32, 146-55(June 1965).

A theory for treating the gross properties of nuclear β decay is proposed. The main point of its method is to investigate the nuclear state which is obtained from the initial state by multiplying the β-decay operator. By this theory it is easily understood that the Fermi transition is usually much weaker than the Gamow-Teller transition, and the latter is also considerably slower than the single-particle estimate. In order to advance a quantitative argument along the line of gross theory, a nuclear model is set up, and formulas for transition rates are derived. (NSA of Japan)

46773 ON THE LEVELS OF THE OCTUPOLE BAND WITH $K^{\pi} = 0^{-}$. Begzhanov, R. B.; Rakovitskii, S. L. (Inst. of Nuclear Physics, Academy of Sciences, Uzbek SSR). Yadern. Fiz., 4: 449-56(Sept. 1966). (In Russian).

Data on states with $K^{\pi} = 0^{-}$ and the spin sequence $I^{\pi} = 1^{-}, 3^{-}, 5^{-}$ ... are collected and systematized. All possible data on rotational levels of the octupole band $K^{\pi} = 0^{-}$ are considered, i.e., the log ft values for β transitions to the states $I^{\pi}K = 1^{-}$, 0 and 3^{-}, 0, in comparison with β transitions to 0^{+} and 2^{+} states of the ground-state rotational band, the position of the levels with $K^{\pi} = 0^{-}$, a comparison of the momenta of inertia of the octupole and ground-state rota-

tional band, excitation probabilities of levels with $K^{\pi} = 0^{-}$, and the branching ratios for the γ decays from these levels to levels of the ground-state rotational band. The collected experimental data are compared with the predictions according to various theoretical models. (auth)

46774 PROTON EMITTERS AMONG THE Te ISOTOPES. Karnaukhov, V. A.; Ter-Akopyan, G. M.; Vertogradov, L. S.; Petrov, L. A. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 457-64(Sept. 1966). (In Russian).

Emitters of delayed protons, obtained in the irradiation of ^{92}Mo by ^{20}Ne and ^{22}Ne ions and of ^{94}Mo by ^{20}Ne ions, were investigated. Proton activities were observed with the decay half lives 4.2 ± 0.2, 19 ± 0.7, 13 ± 2, and 60 to 80 sec. The first two emitters are probably Te isotopes with the mass numbers 109 and 111 respectively. The obtained data are used to estimate the cross sections of ^{92}Mo(^{20}Ne, 4 − 6n) $^{106-108}$Te reactions. (auth)

46775 HALF-LIFE OF THE ELEMENT 102 WITH THE MASS NUMBER 256. Kuznetsov, V. I.; Lobanov, Yu. V.; Perelygin, V. P. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 465-7(Sept. 1966). (In Russian).

The decay half life of the isotope of the element 102 with the mass number 256 was measured in experiments in which a ^{242}Pu target was irradiated by accelerated ^{18}O ions, and was found to be 8.2 ± 1.0 sec. The decay half life was measured according to spontaneous fission, using dielectric detectors of charged particles. (auth)

46776 MASS DIFFERENCE IN MIRROR NUCLEI. Nemirovskii, P. E. Yadern. Fiz., 4: 468-72(Sept. 1966). (In Russian).

The binding energy differences in mirror nuclei E_Q are obtained within 1 to 5%, using the shell model with a Hofstadter charge distribution. The deformation of nuclei in the region A ~ 25 does not contribute significantly to E_Q. The charge density, obtained by assuming that the protons are distributed over the shell levels in the model considered, gives an E_Q value in good agreement with the value following from the Hofstadter distribution, so that the calculation is self-consistent. (auth)

46777 PARTICLE TYPE EXCITATIONS IN THE REGION OF A = 40. Birbrair, B. L.; Bukat, G. M.; Guman, V. N. (Ioffe Inst. of Physics and Tech., Leningrad). Yadern. Fiz., 4: 473-81(Sept. 1966). (In Russian).

Spectra of particle–hole excitations of nuclei with A = 40 are calculated in the framework of the finite Fermi system theory. The constants Γ^{ω} obtained in this region are compared with their values in the region of A = 208. A method of excluding ghost states, applicable in the framework of the phenomenological approach to nuclear theory is suggested and is used to estimate the magnitude of the renormalization effect of Γ^{ω} due to distant states. (auth)

46778 INELASTIC DIFFRACTION SCATTERING OF PARTICLES WITH THE EXCITATION OF NUCLEAR MONOPOLE OSCILLATIONS. Inopin, E. V.; Shebeko, A. V. Yadern. Fiz., 4: 482-5(Sept. 1966). (In Russian).

The method of complex angular momenta is used to calculate the cross sections for the inelastic diffraction scattering of particles, leading to the excitation of monopole nuclear oscillations. A comparison of the formulas obtained with previous calculations, based on the distorted-wave method, made it possible to determine the limits of the applicability of this method. The distorted-wave method can be applied under the condition that the inelastic scattering cross sections are considerably smaller than the elastic scattering cross section. (auth)

46779 THE PROBABILITIES OF E2- AND E3-TRANSITIONS IN ODD DEFORMED NUCLEI. Pyatov, N. I.; Chernei, M. I. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 486-92(Sept. 1966). (In Russian).

The probabilities of E2 and E3 transitions in odd deformed nuclei are calculated in the Nilsson model, taking the influence of pairing correlations into account. Various wave functions from the superfluid nuclear model are used in the calculations. Effective charge parameters are introduced to permit comparison of the theoretical and experimental probabilities. It is shown that the theory agrees with experiments for reasonable values of the effective charge parameter only if modified wave functions are used, taking the blocking effect into account, or are projected on the space of a given number of particles. (auth)

46780 DECELERATION OF SLOW RECOIL IONS. Kaipov, D. K.; Kosyak, Yu. G.; Shubnyi, Yu. K. (Inst. of Nuclear Physics, Academy of Sciences, Kazakh SSR). Yadern. Fiz., 4: 493-6(Sept. 1966). (In Russian).

The distribution of recoil nuclei with respect to the momentum projections are calculated theoretically for the cascade $K-\gamma_2-\gamma_1$. The results of calculations on the weakening of the resonance effect in condensed media, in dependence on the lifetimes of the second levels, are given for $\beta-\gamma_2-\gamma_1$ cascades in ^{60}Ni and ^{24}Mg and for a $K-\gamma_2-\gamma_1$ cascade in ^{48}Ti. The value $\tau_{\gamma} = 6 \times 10^{-12}$ sec was found for the 2.5-Mev level of ^{60}Ni. (auth)

46781 TWO-QUANTUM TRANSITIONS IN ATOMIC NUCLEI; THE ee-PROCESS. Grechukhin, D. P. Yadern. Fiz., 4: 497-504(Sept. 1966). (In Russian).

Two-quantum ee transitions in atomic nuclei due to the conversion of two shell electrons into continuous energy spectrum states are considered. The transition energy of the nucleus is distributed continuously between the conversion electrons. Probability formulas are obtained for all possible types of ee processes in the closed configurations [K, LI, LII, LIII] of electron subshells (for ee-transitions, in which the two electrons are emitted from one subshell, or from different subshells). The results are expressed in terms of the matrix elements of the previously considered two-quantum $\gamma\gamma$ transitions in nuclei. (auth)

46782 INVESTIGATION OF THE REACTION (γ,p) ON SILICON. Goryachev, B. I.; Ishkhanov, B. S.; Kapitonov, I. M.; Seliverstova, Zh. M.; Shevshenko, V. G.; Yurev, B. A. (Moscow State Univ.). Yadern. Fiz., 4: 505-11(Sept. 1966). (In Russian).

Silicon semiconductor detectors were used to measure the yield curves of the reaction ^{28}Si(γ,p) for two groups of protons with the energies $E_p \geq 1$ Mev and $E_p \geq 6.5$ Mev and the energy spectra of photoprotons. The corresponding cross sections were calculated according to the Penfold–Leiss matrix method. For protons with $E_p \geq 1$ Mev the reaction cross sections have maxima at E_{γ} equal to 15.0 ± 0.5, 17.5 ± 0.5, 20.0 ± 0.5, 24.5 ± 0.5 and 26.5 ± 0.5 Mev. The integral reaction cross section up to 28.5 Mev is equal to 330 ± 70 Mev-mb. The maxima at E_{γ} = 24.5 and 26.5 Mev are interpreted as dipole states, produced in transitions from the closed 1p-shell (group B). Maxima are also observed in the high-energy ($E_p \geq 6.5$ Mev) proton group cross section at E_{γ} = 24.0 ± 0.5 and 26.5 ± 0.5 Mev. The integral cross section up to 28.5 Mev is equal to 76 ± 15 Mev-mb. The intensity of group B transitions is significantly lower for the high-energy protons. The photoproton energy spectra were obtained at $E_{\gamma\,max}$ = 21, 22, 26 and 27 Mev. An analysis of the difference spectra (22−21, 27−26 Mev) shows that in the decay of group B dipole states the final ^{27}Al nucleus stays, with a large probability, in a highly excited state. (auth)

46783 PROTON POLARIZATION IN ELASTIC SCATTERING ON ^{58}Ni, ^{59}Co, ^{60}Ni, AND ^{62}Ni. Halil, Munib Adel; Romanovskii, E. A.; Timushev, G. F.; Kovtun, L. V. (Moscow State Univ.). Yadern. Fiz., 4: 512-14(Sept. 1966). (In Russian).

The angular distributions of the polarization were measured in the elastic scattering of protons on ^{58}Ni at 6.53 and 6.14 Mev and on ^{59}Co, ^{60}Ni, and ^{62}Ni at 6.53 Mev. The dependence of the proton polarization on the energy in the scattering on ^{58}Ni and ^{62}Ni was measured for various angles in the energy region from 6.0 to 6.5 Mev. It is shown that the polarization changes, even if the energy changes only slightly. (auth)

46784 CROSS SECTIONS OF THE REACTIONS $^{186}W(n,2n)^{185}W$, $^{184}W(n,\gamma)^{185}W$, $^{186}W(n,\gamma)^{187}W$ FOR FISSION NEUTRONS AND $^{186}W(n,2n)^{185}W$ AND $^{182}W(n,2n)^{181}W$ FOR 14.8-Mev NEUTRONS. Druzhinin, A. A.; Lbov, A. A.; Bilibin, L. P. Yadern. Fiz., 4: 515-18(Sept. 1966). (In Russian).

The (n,γ) and (n,2n) cross sections for W isotopes were measured using the activation method. The following results were obtained: for neutrons with a spectrum similar to the fission spectrum $\sigma_{(n,2n)}$ (^{186}W) = 10.0 ± 0.7 mb, $\sigma_{(n,\gamma)}$ ^{184}W = 65 ± 5 mb, $\sigma_{(n,\gamma)}$ ^{186}W = 51 ± 4 mb; for 14.8-Mev neutrons $\sigma_{(n,2n)}$ ^{182}W = 2.3 ± 0.2 b, $\sigma_{(n,2n)}$ ^{186}W = 2.29 ± 0.23 b. The $^{183}W(n,\gamma)^{184}W$ cross section for neutrons from the spectrum similar to the fission spectrum was estimated to be 360 ± 140 mb. (auth)

46785 MEASUREMENT OF THE POLARIZATION OF A NEUTRON BEAM FROM (d,d)-REACTIONS BY SCATTERING OF URANIUM. Gorlov, G. V.; Lebedeva, N. S.; Morozov, V. M. Yadern. Fiz., 4: 519-20(Sept. 1966). (In Russian).

The elastic scattering of 4-Mev polarized neutrons from (d,d) reactions on U was investigated at the angles 2, 4, and 6°. It follows from the results of differential cross-section measurements that the polarization of a beam of neutrons, produced in (d,d) reaction at the angle α_{lab} = 37° for E_d = 1.20 Mev, is equal to P_d = −15.9 ± 1.8%. (auth)

46786 DEUTERON DISINTEGRATION IN THE FIELD OF Al, Ni, AND Ag NUCLEI. Nemets, O. F.; Sokolov, M. V.; Struzhko, B. G. (Inst. of Physics, Academy of Sciences, Ukrainian SSR). Yadern. Fiz., 4: 521-5(Sept. 1966). (In Russian).

The angular and energy correlations of deuteron disintegration products were investigated using the neutron-proton coincidence method. The angular correlations were measured at θ_p = 50, 60, and 70° for Ni targets and 10, 20, 30, 40, 50, 60, and 70° for Al targets. The neutron detector threshold was set equal to 2 Mev; the protons were detected in the energy region 2.5 to 9.0 Mev. The angular correlations were measured for narrower proton energy regions. The obtained results are compared with the diffraction and electric deuteron disintegration theories. (auth)

46787 DELAYED NEUTRONS AT THE FISSION THRESHOLD OF ^{232}Th. Maksyutenko, B. P. Yadern. Fiz., 4: 526-7(Sept. 1966). (In Russian).

The ratios of delayed neutron group yields from ^{232}Th undergoing fission induced by neutrons with the maximal energies 1.6, 1.9, 2.2, and 2.6 Mev from the reaction $T(p,n)^3He$ on a target thick 12 mg/cm² were measured. The results indicate a significant change in the yield ratio at the ^{232}Th fission threshold. (auth)

46788 STRUCTURE OF SPONTANEOUSLY FISSILE ISOMERS. Malov, L. A.; Polikanov, S. M.; Solovev, V. G. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 528-37(Sept. 1966). (In Russian).

Excited states with equilibrium deformations δ_i higher than the ground-state equilibrium deformations δ_0 of the corresponding nuclei are investigated. Isomers with $\delta_i > \delta_0$ are considered, and it is shown that isomers of a number of odd-odd Pa, Np, Am and Bk isotopes can exist, having lifetimes with respect to spontaneous fission shorter or of the same order as with respect to γ transitions. The energies of such isomers are calculated, and nuclei are shown in which the occurrence of spontaneously fissile isomers is most probable. It is asserted that previously discovered spontaneously fissile isomers are two-quasi-particle excited states with K^{π} = 12−, p505↑ n606↑ and K^{π} = 11−, p505↑ n615↑ with the equilibrium deformation δ_i = 0.32. It is shown that the probability of finding spontaneously fissile isomers in odd and even-even nuclei is very small. (auth)

46789 ABSORPTION OF MOVING $\pi^{\pm}$ MESONS BY LIGHT NUCLEI WITH THE EMISSION OF TWO NUCLEONS AND NUCLEAR STRUCTURE. Kopaleishvili, T. I. (Tbilissi State Univ., USSR). Yadern. Fiz., 4: 538-44(Sept. 1966). (In Russian).

The absorption of moving mesons($\pi^{\pm}$) by ^{12}C and ^{16}O nuclei with the emission of two nucleons is investigated theoretically on the basis of the direct two-nucleon absorption mechanism. Distributions of the emitted nucleons with respect to their relative energies are obtained, as well as the integral cross sections of the reactions (π^+,pp), (π^-,nn) and ($\pi^{\pm}$,np) for various meson energies (≤60 Mev). It is concluded on the basis of a comparison of the theoretically calculated ratio $R = \sigma(\pi^+,pp)/\sigma(\pi^+,np) = \sigma(\pi^-,nn)/\sigma(\pi^-,np)$ with the experimental ratio, that a repulsive core could be present in the residual NN interaction between different nucleons in the nucleus and absent for indentical nucleons. It is shown that in the processes considered, mainly states obtained by knocking out two nucleons from the P shell can be excited in the residual nucleus. Other aspects of these processes are considered. (auth)

46790 ASYMMETRY IN THE ANGULAR DISTRIBUTION OF HIGH-ENERGY NEUTRONS FROM μ^- CAPTURE IN SULFUR. Evseev, V. S.; Kilbinger, F.; Roganov, V. S.; Chernogorova, V. A.; Szimchak, M. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 545-8 (Sept. 1966). (In Russian).

The asymmetry coefficient B in the angular distribution of high-energy neutrons from meson(μ^-) capture in sulphur was measured. The value of the asymmetry coefficient, reduced to 100% residual polarization of the meson(μ^-) is near to −1, thus contradicting calculations based on the universal weak interaction theory. (auth)

46791 INELASTIC SCATTERING OF ELECTRONS ON NUCLEI WITH THE EXCITATION OF COLLECTIVE LEVELS. Petkov, I. Zh.; Lukyanov, V. K.; Pol, Yu. S. (Joint Inst. for Nuclear Research, Dubna, USSR). Yadern. Fiz., 4: 556-63(Sept. 1966). (In Russian).

The inelastic scattering of electrons on medium and heavy nuclei, accompanied by the excitation of low-lying levels, which can be described by macroscopic models, is considered in the adiabatic approximation. The distortion of the electron wave in the field of the nucleus is taken into account in the high-energy approximation. An analytical expression for the scattering amplitude is obtained in the form of a sum of the residua of the poles of the nuclear charge density Fermi distribution. The main contribution comes from the first two complex-conjugate poles. Calculations according to the analytical formulas obtained for the cross sections are in good agreement with exact calculations and are compared with the existing experimental data. (auth)

46792 PRECISION MEASUREMENT OF ^{241}Am GAMMA SPECTRUM. Michaelis, W. (Institut fuer Angewandte Kernphysik, Karlsruhe, Ger.). Z. Phys., 194: 395-404 (1966). (In German)

The gamma spectrum occurring in the α decay of ^{241}Am was investigated with a 4 cm² × 0.5 cm Ge(Li) counter. By reduction of the integral background rate to 11 pulses/min, a detection limit of approximately 10^{-8} γ quanta per α particle was obtained. Eighteen new transitions in the daughter nucleus ^{237}Np were observed. The results confirm the existence of the following band heads: 0 kev, $5/2^+$[642]; 59.6 kev, $5/2^-$[523]; 267.4 kev, $3/2^-$ $1/2$ [530]; 333 kev, $1/2^+$[400]; 358.8 kev, $3/2^+$[651]; 441 kev, $3/2^-$[521]; 721.4 kev, β vibration to $5/2^-$ [523]. For all observed lines absolute intensities were given. The measurement permits, for several excitation states, a comparison of the experimentally reduced transition probabilities with theory. The second level of the β vibration band often decayed to the pertinent interior excitation preponderantly by M1 radiation in contrast to theoretical expectations. (tr-auth)

46793 STUDY OF THE GAMMA TRANSITIONS IN ^{235}U WITH HIGH RESOLUTION. Horsch, F. (Institute fuer Angewandte Kernphysik, Karlsruhe, Ger.). Z. Phys., 194: 405-16(1966). (In German).

By means of a 4 cm² × 0.5 cm Ge(Li) counter precision measurements were made of the γ spectrum in the decay of ^{239}Pu. The measurements show that Ge(Li) counters can be used for very low activities successfully. Gamma lines

with absolute intensities up to 10^{-5}% were detected. The good resolution makes possible the observation of 20 new transitions in the daughter nucleus ^{235}U. The measurements confirm the existence of the following band heads: 0 kev, $^1/_2^-$ [743]; ≤ 0.08 kev, $^1/_2^+$ [631]; 129 kev, $^5/_2^+$ [633]; 333 kev, $^5/_2^+$ [622]; 394 kev, $^3/_2^+$ [631]; 647 kev, ($^1/_2^-$); 768 kev, β vibration to $^1/_2^+$ [631]. (tr-auth)

46794 EFFECTS OF NUCLEAR SPIN ON THE ELASTIC SCATTERING OF 5-Mev NEUTRONS. Buccino, S. G.; Hollandsworth, C. E.; Bevington, P. R. (Duke Univ., Durham, N. C.). Z. Phys., 196: 103-11(1966).

Angular distributions were measured for 5-Mev neutrons elastically scattered from Zr, Nb, Ag, Sb, Ce, Pr, Ta, Au, Tl, ^{206}Pb, Th, and U. Corrections for multiple scattering and finite geometry were calculated using a Monte-Carlo program. The data were fitted with a local potential optical model and were compared with the predictions of a nonlocal potential model. There is evidence of distortions of the angular distributions attributable to nuclear deformations, but there are no observable effects from interactions involving nuclear spins. The cross section for compound-elastic scattering appears to be negligibly small except for Tl and ^{206}Pb. (auth)

46795 NUCLEAR FLUORESCENCE OF THE 0.96-Mev LEVEL OF ^{152}Sm AND SLOWING-DOWN OF Sm ATOMS OF 3 ev ENERGY. Kalus, J.; Lades, H. (Technische Hochschule, Munich). Z. Phys., 196: 129-42(1966). (In German).

In the decay of unstable ^{152}Eu atoms to excited ^{152}Sm nuclei, a pulse is obtained due to neutrino emission after electron capture, the transient course of which depends on the kind and strength of slowing down of atoms in molecules or crystals. In scattering experiments a part of the spectral energy distribution of the emitted quanta was investigated by heating the scatterer using nuclear magnetic resonance fluorescence. This energy, due to the Doppler effect of the velocity, depends on the emitting nucleus. A theory of slowing down permits an explanation of the measurements and yields as the value of the energy of electron capture $E_c = 946 \pm 5$ kev. Investigations were carried out on Eu metal, $EuCl_3 \cdot 6H_2O$ (solid and solution), and Eu_2O_3. (tr-auth)

46796 ELECTRON INELASTIC SCATTERING FROM THE 1.78 Mev- AND 11.4 Mev-LEVELS OF ^{28}Si. Liesem, H. (Technische Hochschule, Darmstadt, Ger.). Z. Phys., 196: 174-84(1966). (In German).

The E2 transition at 1.78 Mev and the strong M1 transition at 11.42 ± 0.02 Mev (measured excitation energy) in ^{28}Si were studied by inelastic electron scattering. Primary energies between 30 and 56 Mev and scattering angles from 104 to 165° were used. In Born approximation, the following radiation widths to the ground state were obtained: $1.21 \pm 0.17 \times 10^{-3}$ ev (1.78 Mev, E2), and 32.4 ± 4.5 ev (11.4 Mev, M1). Transition radii were determined from the dependence of transition probability on momentum transfer. (auth)

46797 THEORY OF NUCLEAR MAGNETIC RESONANCE. Aleksandrov, Igor Vladimirovich. New York, Academic Press, 1966. 203p. $8.75.

Translated from Teoriya Yadernogo Magnitnogo Rezonansa by Scripta Technica, Inc.

The theories of both wide-line and high-resolution nuclear magnetic resonance are presented. Beginning with Kubo's and Tomita's classical treatment, much of the theory of the density-matrix formalism is developed. Tensor algebra, matrix theory, quantum mechanics, and quantum chemistry are used throughout the presentation. (S.F.L.)

46798 THEORY OF BETA RADIOACTIVITY. Konopinski, E. J. The International Series of Monographs on Physics. New York, Oxford University Press, 1966. 412p. $12.00.

An introduction is given to experimental data concerned with beta decay. This is followed by presentations on fermions, Dirac wave fields, the law of β interaction, allowed β emissions, emissions of arbitrary angular momentum, forbidden β emissions, electron and neutrino capture, quantized lepton fields and double β decay, speculations about the β coupling and the neutrino, pion decay, muon decay and the conserved current, and muon and neutretto captures. (S.F.L.)

46799 STUDIES OF THE EFFICIENCY OF AN ANALYZER FOR CIRCULAR POLARIZED γ RADIATION AND MEASUREMENT OF β γ CIRCULAR POLARIZATION CORRELATIONS OF THE ALLOWED AND FIRST-FORBIDDEN β DECAY. Schmitt, H. Heidelberg, Univ., 1965. 63p. $2.00 Gmelin, AED-Diss. 65-325.

Thesis.

The efficiency of an apparatus for measurements of β-γ circular polarization correlations using Compton forward scattering is studied. The results for ^{60}Co, ^{131}I, and ^{22}Na are in agreement with calculated values. The experimental value for ^{133}Xe (81 kev) is higher than the theoretical value. This deviation is explained by spin-dependent Rayleigh scattering. (Gmelin)

46800 BETA DECAY. Wu, C. S.; Moszkowski, S. A. Interscience Monographs and Texts in Physics and Astronomy. Volume XVI. New York, Interscience Publishers, 1966. 408p. $16.00.

A survey of the theory of beta decay and of the crucial experiments on this phenomenon is presented. Leptonic decays of elementary particles are also covered. 520 references. (D.C.W.)

46801 NUCLEAR SPIN-PARITY ASSIGNMENTS. Proceedings of the Conference, Gatlinburg, Tennessee, Nov. 11–13, 1965. Gove, Norwood B.; Robinson, Russell L (eds.). New York, Academic Press, 1966. 473p. $7.50. (CONF-651118).

Papers (48) dealing with techniques for making spin-parity assignments are presented. (D.C.W.)

46802 I CONFERENCIA DE ESPECTROSCOPIA NUCLEAR Y FISICA DEL ESTADO SOLIDO, LIMA, PERU, 24-27 FEBRERO 1964. (Proceedings of the First Conference on Nuclear Spectroscopy and Solid-State Research). Lima, Organizacion de Universidade Catolicas de America Latina, 1964. 186p. (CONF-475).

The 26 papers presented at the First Conference on Nuclear Spectroscopy and Solid-State Research are compiled. Individual abstracts are included for eight of the papers. One paper was previously abstracted in NSA 18: 21121. (J.S.R.)

For abstracts of individual papers see: 45718, 46099, 46244, 46803, 46804, 46946, 46947, and 47095.

46803 PRESENT STATUS OF NUCLEAR SPECTROSCOPY. Bes, D. R.; Mallmann, C. A.; Thieberger, P. (Centro Atomico de Bariloche, San Carlos de Bariloche, Argentina). pp 17-40 of I Conferencia de Espectroscopia Nuclear y Fisica Del Estado Solido. Lima, Organizacion de Universidade Catolicas de America Latina, 1964. (In Spanish).

In nuclear spectroscopy the comparison of theoretical results with experimental data is made by means of groups of physical magnitudes. The most significant theoretical and experimental data are indicated. The most recently developed devices and techniques for the study of nuclear spectroscopy are summarized. The energy levels of nuclei with A = 108 are given. (J.S.R.)

46804 EXCITATION FUNCTION FOR THE ^{197}Au(d, p)^{198}Au REACTION. Paez, E. A.; Sandoval, E. (Instituto de Asuntos Nucleares, Bogota). pp 40-2 of I Conferencia de Espectroscopia Nuclear y Fisica del Estado Solido. Lima, Organizacion de Universidade Catolicas de America Latina, 1964. (In Spanish).

The variation of the cross section for the $^{197}Au(d,p)^{198}Au$ reaction was studied for deuterons with energies between 5.6 and 28 Mev. The theoretical cross-section curve is given, and the experimental results show that the maximum of the excitation function is between 14 and 15 Mev. (J.S.R.)

Plasma Physics and Thermonuclear Processes

See also Fluid Physics and Thermodynamics

Refer also to abstracts 45829, 45838, 45869, 46172, 46323, and 46544.

46805 (AD–628323) MAGNETIC INTERACTION EXPERIMENTS WITH SHOCK IONIZED NEON. Mullaney, G. J.; Brown, E. A. (Boeing Scientific Research Labs., Seattle, Wash. Flight Sciences Lab.). Dec. 1965. 25p. (D–1–82–0499). CFSTI $1.00 cy, $0.50 mn.

A shock tube study of the ionization process in neon and its coupling with an axially symmetric magnetic field is described. Shock Mach number was about 14 and the calculated electron densities were 0 (10 to the 16th power/cc). The increase in plasma luminosity from the upstream to downstream side of the coil when the magnetic field (25 kilogauss range) was present, stimulated an investigation of the light emission with and without the magnetic field. The emission data and pressure measurements were used to substantiate the model of a magnetically formed diffuser. (auth)

46806 (AD–628327) PLASMA OSCILLATIONS. Final Scientific Report. Emeleus, K. G.; Jones, J. M. (Queen's Univ., Belfast (Northern Ireland). Dept. of Physics). Sept. 30, 1965. Contract AF-EOAR-62-68. 21p. (ARL–66-0019). CFSTI $1.00 cy, $0.50 mn.

Investigations are described on the spontaneous oscillation of plasmas maintained by low-voltage electron beams in gas at a pressure of about 0.001 mm Hg. Previous work on oscillations in the plasma electron band (frequency of order of hundreds of Mc/s) and the plasma ion band (frequencies below a few Mc/s) is supplemented by observations on surface waves with frequencies in a broad intermediate band. The bearing of the electron-ion oscillation interaction on plasma turbulence is discussed. The interaction may permit the transfer of electron beam energy to thermal energy of the ions and gas. (TAB)

46807 (AD–639658) NEUTRON PRODUCTION BY FUSION IN A CLASS OF ANISOTROPIC PLASMAS. Langworthy, J. B. (Naval Research Lab., Washington, D. C.). Jan. 20, 1966. 48p. (NRL–6391). CFSTI $2.00 cy, $0.50 mn.

Thesis. Submitted to Univ. of Maryland, College Park.

The neutron production rate of a fusion reaction in a plasma of deuterium is calculated by a non-Maxwellian average, assuming the differential cross section is known. For the average it is assumed the ion velocity distribution of one plasma component is that of a beam and that of the other component is a Maxwell distribution. It is found that cross section anisotropy has no effect on neutron production rate or on the excitation function. An expression is obtained which contains the detailed effects of anisotropy on neutron speed and angle distributions. Prominent behavior of this expression is discussed. For purposes of numerical calculation, a Gamow form is assumed for the total cross section. Neutron production rate results are presented in a contour plot as a function of beam energy and plasma temperature over ranges of the parameters of most interest in thermonuclear research. Prominent behavior here is understood in the light of two well-known subcases of this calculation: (1) neutron production by bombarding a cold target and (2) neutron production from a Maxwellian plasma. A qualitative analysis with order of magnitude estimates is made to consider the practical implications of the use of the assumed nonequilibrium distribution. It is shown that the assumed distribution may exist for small observation volumes and for short observation times in plasma regimes of thermonuclear interest. It is a general result of this analysis that an arbitrary plasma cannot be shown isotropic except by fine time resolution technique. (auth)

46808 (AD–639956) LIMITING CASES IN THE THEORY OF SPHERICAL PLASMA PROBES. Guderley, Karl G. (Aerospace Research Labs., Wright-Patterson AFB, Ohio). June 1966. 80p. (ARL–66-0113). CFSTI $3.00 cy, $0.50 mn.

The field around the probe in a monoenergetic plasma depends upon the probe radius (made dimensionless with a Debye length), the probe potential and the ratio of the energies of the repelled and the attracted charge carriers. Conditions are investigated where some of these parameters become either very large or very small. The investigations round out the results of a former report, where only finite values of these parameters were considered. To obtain the desired limiting behavior formal limiting processes are carried out in the differential equation that governs the field around the probe. This method is by no means new, but the variety of examples that occur in the present problem might be rather instructive. For some of the limiting processes numerical results were included. (auth)

46809 (AD–640582) STUDY OF BASIC PROCESSES IN GASEOUS DISCHARGE PLASMAS. Final Report, July 1, 1960–July 1, 1966. Oskam, H. J. (Minnesota Univ., Minneapolis. Dept. of Electrical Engineering). Contract Nonr-710(37). 15p. CFSTI $1.00 cy, $0.50 mn.

A brief summary of the results obtained on collision processes between particles present in a gaseous plasma is presented. A list of publications, verbal presentations and technical reports during the contract period are added. (auth)

46810 (CEA-R–2942) ETUDE ET REALISATION D'UN ANALYSEUR DE SIGNAUX A HAUTE FREQUENCE. (Design of a High Frequency Analyzer). Bourbigot, Jean (Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires). Jan. 1966. 54p. (EUR–2701.f). Dep. mn.

A device was designed for the amplitude and frequency analysis of electric or electromagnetic signals in the frequency range of 0 to 55 MHz. The frequency spectrum of a preset bandwidth is displayed on the screen of an oscilloscope. Conceived to analyze the electromagnetic oscillations that can be generated in a plasma, its main characteristics are the following: extended bandwidth of analyzed frequencies, on both sides of the ion cyclotron frequency in a magnetic field up to 20 kGs; linear amplitude and frequency response; possibility of analyzing a narrow band; high sensitivity; and analysis repetition rate of 25 per second. (auth)

46811 (IAE–1154) TERMOIZOLYATSIYA PLAZMY V USTANOVKAKH TOKAMAK. (Thermalization of Plasma in Tokamak Installations). Bobrovskii, G. A.; Mirnov, S. V.; Razumova, K. A.; Strelkov, V. S. (Institut Atomnoi Energii, Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow). [1966]. 20p. Dep. mn.

A measure of the thermal insulation efficiency is the term τ_e, which is defined from the condition that $\tau_e = W/[Q-(dw/dt)]$. Here W is the total energy of the plasma configuration, and Q is the amount of heat entering the plasma per unit of time. The term τ_e is called the energy retention time of the plasma. The kinetic energy of the plasma can be determined by measuring the diamagnetic effect: $W_{kin} = 3/4\ [(I^2/e^2) - (H_z \Delta\phi/2\pi)]$. Here I is the current strength; $\Delta\phi$ is the change in flow of the longitudinal magnetic field, and H_z is the field strength on the loop axis. The value of Q is calculated from measurements of current, voltage, and inductance of the plasma loop. The data are handled by computer. The results show that the kinetic energy content of the plasma increases with increasing initial pressure. The value of τ_E on the T-3 unit is very small at the beginning of the discharge, and attains a maximum of 4 msec at a time of 8 milliseconds after electric breakdown. The maximum W on the T-3 unit is shifted in phase 1 to 2 msec with respect to the current maximum. The radial distribution of n_e can be expressed as follows: $n_e = n_0\ [1-(r^2/a^2)]$. Considerable cooling of the plasma is noted around the edges of the diaphragm. A large discrepancy is noted between electron temperatures measured by diamagnetism and by electrical conductivity. The causes for the energy losses in the Tokamak units are not known as yet. (TTT)

46812 (JINR–P–2829) OPREDELENIE METODOM MAKSIMUMA PRAVDOPODOBIYA PARAMETROV ZARYA-

ZHENNOI CHASTITSY, DVIZHUSHCHEISYA V TORMOZYASHCHEI RASSEIVAYUSHCHEI SREDE, POMESHCHENNOI V NEODNORODNOE MAGNITNOE POLE. (Determination of the Parameters of a Charged Particle Moving in a Stopping Scatterer Placed into a Inhomogeneous Magnetic Field by the Maximum Likelihood Method). Emel'yanenko, G. A.; Lomov, K. P.; Makarenko, G. I.; Moroz, V. I.; Saitov, I. S.; Stel'makh, A. P. (Joint Inst. for Nuclear Research, Dubna (USSR)). 1966. 41p. Dep. mn.

The maximum likelihood method is used to determine the initial momentum and angles of a nonradiating particle moving in stopping and scattering matter placed in an inhomogeneous magnetic field. Stopping and multiple scattering of the particle, as well as the inhomogeneity of the magnetic field are studied simultaneously. (auth)

46813 (JUL-358-PP) UNTERSUCHUNGEN ZUR ELEKTRODENLOSEN BESCHLEUNIGUNG VON PLASMA FUER DIE ENTWICKLUNG EINES RAUMANTRIEBS. (Investigation on Electrodeless Acceleration of Plasma for the Development of a Space Propulsion System). Tuczek, H. (Kernforschungsanlage, Juelich (West Germany). Institut fuer Plasmaphysik). Mar. 1966. 73p. Dep. mn.

For the development of an electrodeless plasma propulsion installation, the inductive acceleration of plasma in a conical ring discharge, in a pulsed traveling wave, and in a periodic traveling wave was investigated. In the conical ring discharge a current produces in a coil with conical profile a time-changing inhomogeneous magnetic field in which the preheated plasma is accelerated. In the pulsed traveling wave, which leads to a chain guide, the acceleration of an injected plasma occurs in the inhomogeneous magnetic field of the wave front. In the periodic traveling wave, which consists of several attenuated wave trains, the plasma is produced by the wave itself. The results with the conical wave discharge and the pulsed traveling wave show that at densities below 10^{15} cm^{-3}, in which ion collisions do not essentially affect the processes, plasma is effectively accelerated. The acceleration process can be described by a single-particle model with elastic reflection of the ions. Since, according to the measurements, it is possible on periodic traveling waves to produce and accelerate plasma without supplementary preheating, the technological construction of a plasma propulsion system is simplified. From the investigation it was determined that at operational densities of approximately 10^{14} cm^{-3} an electrodeless plasma propulsion installation with thrust up to 1 kp can be developed. (tr-auth)

46814 (JUL-360-PP) ERZEUGUNG VON SERIENGRENZKONTINUA MIT HILFE VON GLEITFUNKEN ZUR ABSOLUTMESSUNG IM VAKUUM-ULTRAVIOLETT. (Production of Series Limit Continua With the Help of Sliding Sparks for the Absolute Measurement in the Vacuum Ultraviolet). Conrads, H. (Kernforschungsanlage, Juelich (West Germany). Institut fuer Plasmaphysik). Mar. 1966. 47p. Dep. mn.

Triggerless sparks sources in high vacuum were developed and these produced for several hundred nanoseconds an intensive emission spectrum for excitation and ionization energies of at least 390 ev. From a Li plasma in the visible and infrared during this time, bremsstrahlung of Li III, line radiation in the vacuum ultraviolet, and the recombination continua of Li III were emitted. Carbon plasmas show bremsstrahlung of C IV line radiation of C V and C VI, and recombination continua of C V. The electron temperature T_e was determined from the absolute intensities in the infrared emitted from optically thick layers and the electron density N_e was determined from the intensities in the visible emitted by optically thin layers and by the strong broadening of the Lyman series of Li III. During the observation time the temperature decreases and the density increases constantly. Carbon plasmas with $T_e = 450{,}000°K$ for $N_e = 1.5 \times 10^{19}$ particles/cm^3 and Li plasmas with $T_e = 230{,}000°K$ for $N_e = 5 \times 10^{18}$ particles/cm^3 could be produced. For these temperatures and densities of the Li plasma the free electrons possess a Maxwell distribution, the response time for the ionization equilibrium is short compared with the oxidation time, and Li III is almost completely ionized so that the emission coefficients for recombination radiation can be calculated. The temperature is constant along the spark axis. The plasma layers possess a defined length so that the absolute intensities of the recombination continua can be determined. The absolute intensities of the series limit continua of the Lyman series of Li III determined from a simultaneous intensity measurement in the infrared, visible, and vacuum ultraviolet regions were given between 60 and 100 Å. (tr-auth)

46815 (JUL-374-PP) A 40 kv CONDENSER BANK OF EXTREMELY LOW INTERNAL INDUCTANCE. Anger, W.; Bohn, F. H.; Friedrich, F. J. (Kernforschungsanlage, Juelich (West Germany). Institut fuer Plasmaphysik). Apr. 1966. 20p. Dep. mn.

A 15 kJ condenser bank for magnetic compression experiments is described. The operating voltage is 40 kv and the internal inductance 3 nH. The rate of rise of the current under short-circuit conditions is 1.3×10^{13} amp/sec 60 units; each consisting of a 40 kv/0.31 uF coaxial condenser, a pressurized spark gap, and a special current-conductor, are switched in parallel and connected to the load by means of a two-plate collector system. The spark gap inductance is 10 nH and its jitter time stays below 10 nsec without resetting the electrodes in an operating range of 16 to 50 kv. This permitted a reduction of the decoupling length of the conductors to 1 m. Each current-conductor is composed of a coaxial transmission line with an internal inductance of 12 nH/m. For the construction of the collector system, it was essential to achieve minimum inductance and to obtain a high lifetime of the insulating foil. These two requirements were fulfilled by choosing an initial insulating thickness of 0.6 mm, and by constructing a highly rigid collector system that allowed a surface planeness of better than ±0.01 mm and an extremely good surface quality. Large amplitude oscillations of the plates during the discharge are thus suppressed, achieving rather uniform mechanical stress. Later the insulating thickness can be further decreased to 0.4 mm thereby reaching the limit of electric stress. In a coil of 15 cm length and 42 mm diameter, magnetic fields up to 120 kG with a quarter period of 0.65 μsec have been generated. (auth)

46816 (JUL-381-PP) ARBEITSBERICHTE DER THEORETISCHEN UND EXPERIMENTELLEN GRUPPEN FUER DAS JAHR 1965. (Work Report of the Theoretical and Experimental Groups [in Plasma Physics] for 1965). Vogelbruch, K. (comp.) (Kernforschungsanlage, Juelich (West Germany). Institut fuer Plasmaphysik). June 1966. 108p. Dep. mn.

Studies made in the theory of plasma physics, experimental production of high-temperature plasmas, acceleration of plasmas, plasma analysis, and engineering are summarized. Results are reported on the following: stability of one-dimensional plasmas, waves of finite amplitude in collision-free plasma with magnetic fields, stationary boundary layers between plasma and magnetic field, kinetic theory of radiation emission and absorption in plasma, mass determination in irreversible thermodynamics, calculations on a pulsed two-dimensional magnetic field, adiabatic invariants in one-dimensional fields, mathematical theory of pressure propagation of spectral lines, numerical treatment of θ pinch in magnetohydrodynamic approximation, studies on the plasma stability in the 600-kJ compression experiment, production and compression of plasma in cusp geometry, structure of collision waves in collision-free plasmas, density measurements on plasmoids, particle loss in the acceleration of plasma using a traveling-wave, high-voltage studies for a three-stage 80-kv plasma accelerator, determination of the plasma parameter for a continuous acceleration, production of traveling waves with h-f senders, electron loss processes in a decaying H plasma, gas ionization in homogeneous magnetic fields increasing lineally with time, determination of ionization degrees in electric fields at high electron densities, studies on stationary high-frequency ring discharges, static Stark effect, interactions between plasmas and neutral matter, compari-

son of the absolute intensities of the radiation of a high-temperature plasma in the visible region and in the region of soft x radiation, high intensity arcs, production of series limit continua, magnetic field measurements in plasma of a θ pinch, stability studies and interference measurements on a θ pinch, development of constructional elements for a microwave interferometer, studies on Rubin lasers, a trochoid spectrometer for plasma ions, construction of condenser batteries, technical developments for the construction of cusp experiments. Metallization of plastic surfaces, and production of a subprogram for Bessel functions. (J.S.R.)

46817 (JUL-384-PP) ADIABATISCHE INVARIANZ IM MITTEL BEI RAEUMLICHER FELDUMKEHR. (Adiabatic Invariance in the Mean of Spatial Field Reversal). Janicke, Lutz (Kernforschungsanlage, Juelich (West Germany)). Institut fuer Plasmaphysik). July 1966. 48p. Dep. mn.

The adiabatic invariance properties of charged particles in transient weakly but spatial strongly changing electromagnetic fields were investigated. Such fields which lead to the problem of the one-dimensional oscillator whose potential shows two minima were considered specially. This potential form occurs in fields with spatial field reversal, for instance in the β pinch with antiparallel interior magnetic fields. For particles with energy values in the vicinity of the intermediate maximum, the adiabatic invariance of the effective integral $J = \phi$ pdq, detectable above and below in the regions, is no longer valid. J is no longer a constant function of the energy. These difficulties can be eliminated by a modification of the definition which permits the invariants to be unaltered in the usual areas. For the modified magnitude K, it can be shown by utilization of the conservation of area in the phase plane, that a random particle group in the phase plane of the one-dimensional oscillator K, in the mean, is adiabatically invariant in the system ϵ $\ln^4\epsilon$. (tr-auth)

46818 (MATT-383) EVALUATION OF ARC DAMAGE TO POWER TRIODE GRID WIRES. Bronner, G.; Murray, J. G.; Sorrentino, J. P. (Princeton Univ., N. J. Plasma Physics Lab.). Sept. 1966. Contract AT(30-1)-1238. 35p. (CONF-661016-16). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

Experiments involving aluminum foil damage tests and a simulated grid structure were performed in order to relate such tests to the minimum energy required to damage the grid structure of a type A-15186C tube. In the case of foil tests conducted in air, it was shown that the energy in a particular fault is related to the foil hole size and is in close agreement with engineering calculations and published data. In a vacuum arc gap the damage is much less than indicated by the air foil test. The arc becomes mobile and the energy dissipation appears widespread over the surface area rather than being concentrated or anchored in a spot. With energies up to 100 J and charges up to 0.25 C, more than 100 pulses were required to damage simulated grid wires to the extent where breakage occurred. On a single shot basis energies in excess of 3000 J were required to produce damage. (auth)

46819 (NP-16293) ANNUAL REVIEW, APRIL 1965-MARCH 1966. (Institute of Plasma Physics, Univ. of Nagoya (Japan)). 103p. Dep. mn.

Various experiments were performed dealing with the QP machine, MACETIE I and II devices, Heliotron machine, and other plasma containment devices. The results for each are briefly outlined. In addition, experiments were performed on the following: mechanism of r-f heating of electrons in a magnetic bottle, measurement of the excitation function of O_2^+ first negative band and CO_2^+ bands by electron impact, electron energy distribution and population densities of the excited atoms in a quiescent positive column of a helium glow discharge, probe noises of quiet plasma, resonances of r-f probe, excitation of plasma wave near second harmonic, negative absorption in partially ionized gases, electron plasma oscillations, infrared gas-laser experiments, and various theoretical studies. (M.O.W.)

46820 (NP-16321) WILLS PLASMA PHYSICS DEPARTMENT ELEVENTH SIX-MONTHLY PROGRESS REPORT, JANUARY 1-JUNE 30, 1966. (Sydney Univ. (Australia). School of Physics). 12p. (PR-11). Dep. mn.

Brief summaries of plasma research at Sydney are presented. The research includes work on plasma sources, compressional wave studies, large amplitude Alfvén waves, surface microwave reflections, longitudinal wave propagation, lasers, and the magnetic field of the moon. (M.O.W.)

46821 (NP-16322) THE STEEPENING OF FINITE-AMPLITUDE ALFVEN WAVES. Green, B. J. (Sydney Univ. (Australia). School of Physics). July 1966. 22p. (TR-19). Dep. mn.

The steepening (to shock discontinuities) of plane-polarized Alfvén waves of finite amplitude, which propagate parallel to a steady magnetic field in a fully ionized plasma, was investigated. The theory used is valid to the second order, and is compared with results obtained in an experimental study of these waves. (auth)

46822 (NP-16323) PROPERTIES OF A LABORATORY PLASMA PREPARED WITH COMBINED TRANSVERSE AND AXIAL CURRENTS. Brown, I. G.; Lehane, J. A.; Potter, I. C.; Watson-Munro, C. N. (Sydney Univ. (Australia). School of Physics). Aug. 1966. 24p. (ER-20). Dep. mn.

It was found that a plasma prepared by a "hybrid" method with ionizing currents, both transverse and parallel to the steady magnetic field, has distinct advantages for certain experiments. The hybrid method of preparation is described along with results on the current distribution in the plasma and on the conditions limiting the use of this method. A detailed investigation of typical plasmas produced by this method was made. The gross behavior of the plasma was studied with an image convertor camera; particle densities were determined from Stark spectral observations and from laser interferometry; electron temperatures from spectral observations and from plasma electrical conductivity. Alfvén waves were used to obtain information on total particle density, fractional ionization and electron temperature. The results are presented graphically to show the spatial and time variations of particle density and electron temperature. (auth)

46823 (SU-IPR-90) ELECTRON BEAM PROBING STUDIES OF BEAM/PLASMA INTERACTIONS. Cannara, A. B.; Crawford, F. W. (Stanford Univ., Calif. Inst. for Plasma Research). Aug. 1966. Contract AT(04-3)-326. 34p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Experimental observations are described of electron beam/plasma amplification in a low-pressure, beam-produced, mercury-vapor discharge. A nonperturbing probing technique, employing a fine auxiliary electron beam, was used to measure r-f growth, phase velocity, and axial and radial electric field profiles in the interaction region. The comprehensive data obtained were compared with predictions based on cold and warm plasma theories of beam/plasma amplification. It is concluded that the experimental growth rates and electric field profiles are approached more closely by warm plasma theory, but that the measured phase velocities are somewhat slower than either theory suggests. The electric field profiles are smoother than expected, probably owing to the beam boundary being less sharp in practice than is assumed in the theories. (auth)

46824 (UCID-15018) ON THE POSSIBILITY OF RADIAL LOSSES OF THE E-LAYER DURING THE INJECTION PHASE DUE TO THE NEGATIVE MASS INSTABILITY. Christofilos, N. C. (Lawrence Radiation Lab., Univ. of California, Livermore). Aug. 31, 1966. Contract W-7405-eng-48. 5p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Some preliminary results on measuring radial losses of the E-layer during the first pass along the machine lead to

the premature conclusion that the negative mass instability may cause unlimited losses of the injected electrons, namely causing a continuous exponential decay of the injected current along the Astron tank. In order to dispel the thus created confusion, the possibility of radial losses is discussed by describing and calculating the effect of the negative mass instability. (M.O.W.)

46825 (UCID–15022) MAGNETIC FIELD GENERATED BY A HELICAL GUIDING COIL IN THE ASTRON TANK. Christofilos, N. C. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 29, 1966. Contract W-7405-eng-48. 5p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A helical coil was installed in the Astron tank in the region of the inflector. The purpose of this coil is to create a magnetic field groove to guide the injected electrons so that they miss the inflector after their first turn in the Astron tank. The radius of the coil is smaller than the orbit radius of the injected electrons. The coil is a double helix with the current alternating in adjacent conductors. The field distribution is solved analytically in the idealized case where the coil's radial thickness is zero and the helix is represented by axisymmetric loops, with the current alternating in adjacent loops. A description of the system is included. (M.O.W.)

46826 (UCRL–14914) ONE-DIMENSIONAL CALCULATION OF THE TIME-DEPENDENT CONDUCTIVITY OF GASES WITH A STRONG VARIABLE SOURCE OF IONIZATION. Barnes, W. S. (Lawrence Radiation Lab., Univ. of California, Livermore). May 26, 1966. Contract W-7405-eng-48. 49p. Dep. mn. CFSTI $3.00 cy, $0.50 mn.

A one-dimensional diffusion-mobility theory calculation involving the transport of ions and electrons in gases is described. The method of calculation is designed for application to problems involving (1) a strong variable source of ionization which is independent of the densities of the several ion species and (2) electric fields which are not independent of space charge effects. These calculations were carried out by computer programs which use an explicit differencing scheme and allow the overall voltage across the system to be varied by the effect of current flow in an external circuit. Quantities calculated as functions of space and time are the electric field, conductivity of the gas, ion, current, and source densities for electrons and positive and negative molecular ions. The current in the external circuit is also calculated as a function of time for comparison with experimental values. (auth)

46827 (UCRL–70014) MERCURY-JET SWITCH. Branum, D. R.; North, G. G. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 17p. (CONF-661016–3). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

To meet the high-current, long-duration series switching requirements of the electrolytic capacitor banks used with the Levitron experiment, development was begun on a fast mechanical switch using a mercury-jet as contact medium. The prototype switch is air-operated, with the mercury being stored in 2-in. i.d. stainless steel bellows. By abruptly applying air pressure to the outside of the bellows, the mercury is ejected from the bottom electrode through a 1-cm diameter orifice toward the top electrode. The electrodes are enclosed by a pyrex glass section which is evacuated. Initial load tests on the switch were made with a capacitor bank-coil combination capable of giving an 8000-A peak current with a ¼-cycle rise time of 11 msec, and a 25-msec L/R decay. In tests, the switch has operated up to the available peak of 8000 A repeatedly and gives every indication of being able to greatly exceed this figure, as inferred by the nominal 8-v drop across the switch at 8000 A. The closing time of the switch for these tests was 20 ± 0.2 msec. (auth)

46828 (UCRL–70015) A REPLACEMENT THYRATRON FOR THE ASTRON ACCELERATOR. Cooper, James H. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 10p. (CONF-661016–4). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

A test set was constructed to reproduce accelerator characteristics with a variable 32-kv resonant charge power supply, pulse amplifiers, a prefire detector and a 1-nsec time delay counter. The thyratrons were tested at a 1440 pulses per second pulse rate, 0.4 μsec long, with bursts of pulses up to 100 pulses per burst, and 2 seconds per burst. Anode delay stability was tested by recording delay time from grid pulse to load pulse while the operating conditions were changed from 32 kv, 10 ppb to 32 kv, 100 ppb to 25 kv, 10 ppb and back to 32 kv, 10 ppb. The pulse forming network had a characteristic impedance of 7 ohms and resistive loads of 6.2 and 8.3 ohms were used. Anode delay as a function of heater voltage was also tested. The tests indicated reliable operation at 32 kv without preconditioning an average anode delay of 143.8 nsec, and average drift of anode delay of 14 nsec, an average anode delay variation of 33.5 nsec with a rise time of less than 50 nsec for a group to ten tubes tested. A full set of these deuterium tetrode thyratrons installed would greatly enhance the operation of the ASTRON accelerator. (auth)

46829 (UCRL–70019) DEVELOPMENT OF THE ASTRON FAST-PULSING SYSTEM. Saunders, Kenneth A. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 22p. (CONF-661016–13). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

The pulsing equipment for the ASTRON linear accelerator was modified to operate in a burst mode. This would provide a 100-pulse burst at a maximum rate of 1440 pps, with a long-term average pulse rate of 60 pps. The modification consists mainly of providing a charging system capable of recharging the pulse forming networks at this increased rate. Presented are the design criteria, the over-all systems modifications, the hardware used, and some of the problems encountered in the development of this system. (auth)

46830 (UCRL–70021) PROTECTION CIRCUITRY FOR THE ASTRON FAST PULSER. Johnson, Milton D. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 17p. (CONF-661016–9). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

A hard-tube modulator was developed for the ASTRON fast-pulsing system. The capacitor energy storage system consists of a 205-μF capacitor bank at 40,000 v, or a stored energy of 164,000 joules. The 3-phase generator, operating into a full-wave rectifier network, is capable of producing 4000 A under short circuit conditions. A General Electric Magne-blast circuit breaker removes the generator from the line in 0.1 sec or about five cycles. Circuitry was developed and resistors were placed throughout the capacitor bank to protect against bank reversal. Two 40,000-v ignitrons were used in series across the bank. These ignitrons would handle the bank discharge current but their coulomb rating was not large enough to take the generator output for the 0.1 sec. Therefore, a vacuum switch was placed in parallel with the ignitrons. Design criteria, circuitry and results of the tests are reported. (M.O.W.)

46831 (UCRL–70024) LIQUID HELIUM CRYOPUMPS FOR A LARGE PLASMA RESEARCH MACHINE. Denhoy, Balwant S. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 17p. (CONF-661016–5). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

The liquid He cryopumps discussed here are designed to meet specific requirements for hydrogen pumping in the 10^{-12} torr range. They are designed to have about a 2000 liters/sec pumping speed. The design meets configuration and space requirements, and also has the required pumping

surface. All stainless steel construction is used to avoid magnetic coupling. Complicated mechanical supports are used to minimize the heat loss. In one pump a physical property of liquid helium (low viscosity) is utilized to solve the configuration problem. A model of such a pump was made to study this phenomenon. The test results of the model are presented. (auth)

46832 (UCRL-70030) EXPLOSIVELY-ACTUATED HIGH-VOLTAGE SWITCH FOR ASTRON FAST-PULSE SYSTEM. Peterson, Leslie F.; Cooper, James H. (Lawrence Radiation Lab., Univ. of California, Livermore). Sept. 23, 1966. Contract W-7405-eng-48. 8p. (CONF-661016-10). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tenn.

The ASTRON fast-pulse system is designed to provide the ASTRON experiment accelerator with burst rates of 1440 pulses/sec. In the event of malfunctions in the capacitor bank or modulator portions of the system, high currents may flow in part or all of the capacitor bank charging diodes until the main circuit protective breaker removes the entire system from the line. As a means of minimizing the voltage on the diodes and limiting the energy which could be put into the diodes under fault conditions, a fast-acting, explosively actuated, high-voltage switch was designed to short the 3-phase supply to the diodes within a few msec of the fault. (W.D.M.)

46833 (AEC-tr-6674) NUCLEAR FUSION (TRANSLATED SELECTED ARTICLES). Translation of Nuclear Fusion, 6: No. 2, 83-100; 118-29(1966). 76p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

46834 TRANSIENT FIBER OPTICS PROBE FOR SPACE-RESOLVED DIAGNOSTICS OF DENSE PLASMAS. Stojanoff, Christo G. (Columbia Univ., New York). Contracts AF 33(615)-1141 and AF 49(638)-1395. AIAA (Amer. Inst. Aeron. Astronaut.) J., 4: 1766-72(Oct. 1966).

A new type of probe for measuring local values of radiant intensity in dense plasmas is presented. The probe consists of a thin tube with blackened interior and is fitted with an end cap that limits the sampled radiation to a plasma volume ~1 mm^3 between cap and tube end. The sampled light is transmitted from the rear end of the tube via a flexible fiber optics bundle to an optical filter, photomultiplier, and associated read-out instrumentation. The measurement is made by driving the probe at high speed (750 cm/sec) through the plasma column by means of a valve-operated pneumatic drive. The adaptation of the instrument to space-resolved temperature measurements by the absolute line intensity method and the line ratio method is described and compared to the standard spectrographic technique. Chief advantages of the transient probe method are simplicity in both diagnostic and data processing apparatus and applicability to plasma of arbitrary shape. (auth)

46835 OPTIMIZATION OF THE THERMAL EFFICIENCY OF THE MAGNETIC ANNULAR ARC. Schneiderman, A. M.; Patrick, R. M. (Avco Research Lab., Everett, Mass.). Contract NAS 3-5748. AIAA (Amer. Inst. Aeron. Astronaut.) J., 4: 1836-8(Oct. 1966).

A parametric study of the thermal efficiency of the magnetic annular arc showed that, over the operating range studied, the thermal efficiency increases with increases in the quantity U_cBl/V_0, where U_c is the velocity a particle has when its kinetic energy equals the energy required to ionize and dissociate it, B is the magnetic field strength, l is a characteristic length of the order of the anode-cathode spacing, and V_0 is an integration constant. Experimental studies made included studies of effects of cathode location on V_0 and of the relation of V_0 to the anode voltage drop. (A.G.W.)

46836 PROBE MEASUREMENTS IN AN ELECTRODELESS DISCHARGE. Keefer, D. R.; Clarkson, M. H.; Mathews, B. E. (Univ. of Florida, Gainesville). AIAA (Amer. Inst. Aeron. Astronaut.) J., 4: 1850-2(Oct. 1966).

Both symmetric and asymmetric probe systems were used to measure electron number density and electron temperature distributions in an electrodeless discharge. Results showed that highly asymmetric double probes can be used to obtain Langmuir-type probe data. In general, symmetric probes do not yield the same results because the distribution of electrons is not Maxwell-Boltzmann. Asymmetric-double-probe data indicate that electron production in an electrodeless discharge is not restricted to regions near the outer wall. (A.G.W.)

46837 INTERACTION OF HIGH-DENSITY PLASMA WITH HOT CATHODE. Rohatgi, Vijay K. (Space Sciences Inc., Waltham, Mass.). AIAA (Amer. Inst. Aeron. Astronaut.) J., 4: 1852-4(Oct. 1966).

A study of the interaction of a dense plasma with a negatively biased solid surface at elevated temperatures was limited to the uniform-current-density cathode phenomena only. It was found that at high temperatures the probe current depends upon both temperature and probe material. Several electron-emission processes are considered in an attempt to understand these results. It is proposed that the observed phenomena be explained in terms of the ion-diffusion current from the plasma, including the accommodation and reflection coefficients from the surface in addition to the possible electron-emission mechanisms. (A.G.W.)

46838 EXPERIMENTAL STUDY OF A TRAVELING WAVE ACCELERATOR. Seemann, G. R.; Thornton, J. A.; Penfold, A. S. (Litton Industries, Beverly Hills, Calif.). Contracts AF 33(615)-2548 and AF 49(638)-1251. AIAA (Amer. Inst. Aeron. Astronaut.) J., 4: 1870-2(Oct. 1966).

Some preliminary experimental results obtained in an investigation of plasma flow processes in a slip-type traveling-wave accelerator are reported. Pumping and injector limitations have so far limited the experiments to conditions in which the entrance velocity is less than $(\gamma - 1)/\gamma$ of the field speed and to subsonic flow. Typical operation has been between two and four minutes with over one hour of accumulated time at a power level of 45 kw or more with no accelerator damage. The accelerator operation is quite sensitive to inlet conditions, in particular to those relating to the azimuthal symmetry of the preionizer discharge. Maximum preionizer power is needed to produce a sufficient electrical conductivity to start the machine. Once the machine is in operation and the conductivity within the accelerator channel is being maintained by joule heating processes, a decrease in preionizer power results in improvement in the accelerator stability, impact pressure, and gas luminosity. (A.G.W.)

46839 MAGNETOGRAVITATIONAL INSTABILITY OF AN UNBOUNDED PLASMA WITH HALL CURRENT AND LARMOR RADIUS. Hans, H. K. (Univ. of Delhi). Ann. Astrophys., 29: 339-41(July-Aug. 1966).

Jeans criterion for the gravitational instability of an infinite homogeneous medium in the presence of Hall current and finite Larmor radius was investigated. (auth)

46840 EXCITATION AND IONIZATION OF A HYDROGEN PLASMA UNDER THE INFLUENCE OF SEVERAL ELECTRON GROUPS AT DIFFERENT TEMPERATURE AND DENSITY. Drawin, H. W. (EURATOM-CEA, Fontenay-aux-Roses, France). Ann. Physik (7), 17: 374-96(1966). (In German).

Under certain experimental conditions it is necessary to explain the measurements by assumption of several groups of electrons independent of each other. For such a case the population densities and degrees of ionization were calculated for a steady-state hydrogen plasma from the coupled system of rate equations. It was assumed that two independent groups of electrons are present having the density n_e and n_e^*. Further it was assumed that their distribution functions are Maxwellian, so that these groups can be described by temperatures T_e and T_e^*. The calculated population densities and ionization degrees are presented graphically as function of n_e^*, n_e, T_e and T_e^*. A comparison with the measurements of H. Schlüter shows good agreement. (auth)

46841 CRYOGENIC MAGNETIC MIRROR MACHINE VGL-2. Borovik, E. S.; Busol, F. I.; Glasov, B. V.; Kovalenko, V. A.; Skibenko, E. I.; Yuferov, V. B. At. Energ. (USSR), 21: 130-1(Aug. 1966). (In Russian).

Plasma infection into a small-volume magnetic trap with strong magnetic field was investigated using a new design cryogenic magnetic trap VGL-2. The trap consisted of a magnetic system placed into a large vacuum chamber, 1.8-m long and 1.2-m in diameter, constructed with an ordinary soft steel and packed at the seams with a vacuum rubber. The maximum vacuum of the system ($\sim 5 \times 10^{-10}$ torr) was achieved by a complete screening of the vacuum chamber walls by a copper screen cooled to the liquid nitrogen point and by high-speed pumping at 10^5 l/sec. The energy of injected ions was 30 kev. With the magnetic field in the trap center ~60 kG, the capture factor was $\alpha \approx 5 \times 10^{-4}$. Plasma density determined by the value of the recharged atom flux was $n^+ \approx (3 \text{ to } 4) \times 10^7$ cm^{-3}, and accordingly, the injected current into the trap was $n^+ \approx 3 \times 10^8$ cm^{-3}. (R.V.J.)

46842 SOURCE OF POLARIZED IONS WITH CURRENT 1.2 μ AMPS. Slabospitskii, R. P.; Karnaukhov, I. M.; Kiselev, I. E.; Taranov, A. Ya. At. Energ. (USSR), 21: 131-2 (Aug. 1966). (In Russian).

A design is given of a source of positive, polarized deuterium ions having a 1.2 μ amp current force in which the atomic current was ionized by separation of the atomic beam according to electron spins in a strong inhomogeneous magnetic field, followed by an adiabatic extraction into a weak magnetic field. The polarization tensor of the deuterium beam was determined by measuring the differential cross section of the reaction $T(d,n)^4He$. The polarization tensor at a current of 1.2 μ amp was equal to $P_{33} = -0.274 \pm 0.012$. (G.O.Y.)

46843 STABILITY OF A SELF-ROTATING CYLINDRICAL PLASMA IN RELATIVE EQUILIBRIUM. Cretin, Monique; Tassoul, Jean Louis (Univ. Libre, Brussels). Bull. Cl. Sci., Acad. Roy. Belg. (5), 52: 113-30(1966). (In French).

The gravitational stability of a uniformly rotating cylindrical plasma with finite radius is investigated in terms of normal modes. The whole space is filled with a uniform axial magnetic field but, in the vacuum surrounding the fluid, this field presents moreover an azimuthal component which decreases proportionally to the distance from the axis of symmetry. The dispersion relation is solved numerically. While the axial component of the magnetic field increases the wavelength beyond which the symmetrical mode becomes unstable, the external azimuthal component of the field and the rotational motion both enhance the instability of this mode. The behavior of the unsymmetrical modes is more complex. The rotational motion enhances their overstability for large wavelengths. On the contrary, the stretching of the external magnetic field enhances their instability for middle- or short-range wavelengths. The actual nature of the instability and the domain of unstable wavelengths depend upon the relative importance of the rotational angular velocity and the stretching of the external magnetic field. (auth)

46844 MACROSCOPIC EQUILIBRIUM OF AN ION SYSTEM WITH RESPECT TO A ROTATING REFERENCE SYSTEM. Patrauela, Nicolas (Institutul de Mecanica Fluidelor, Bucharest). Compt. Rend., Ser. A, 263: 326-8 (Aug. 1, 1966). (In French).

The possibility of realizing three-dimensional potential wells for charged particles, according to the equations of relative equilibrium with and without thermal agitation, is demonstrated. In the nonrelativistic case, the functions G_1 and G_2 are introduced which are connected with a mixed, electromagnetic and inertial field as a function of which the equations of equilibrium of a homogeneous system of ions are described. (tr-auth)

46845 IONIC COMPOSITION OF THE SILENT DISCHARGE POSITIVE COLUMN IN INERT GASES AT ELEVATED PRESSURE. Starodubtsev, S. V.; Pozharov, S. L.; Chernov, I. G.; Knopov, V. M. (Inst. of Nuclear Physics, Academy of Sciences, Uzbek SSR). Dokl. Akad. Nauk SSSR, 168: 325-7(May 11, 1966). (In Russian).

Silent discharge in helium and argon was investigated mass-spectroscopically at partial pressures of 5 to 50 mm. The partial pressure of mercury was ~10^{-3} mm. The helium was purified by passing through silica gel cooled by liquid nitrogen. The absolute ion intensity was determined by withdrawing a sample through a hole in the anode. In the argon discharge, ions with mass numbers of 40, 80 and 202 were assigned to Ar^+, Ar_2^+ and Hg^+. A small amount of ArH^+ was found unexpectedly. A molecular ion Hg_2^+ was found at a mass number of 404 at an intensity of 1% with respect to the Ar^+ peak. This mercury ion was not noted in the helium discharge, where peaks with mass numbers of 9 and 12 showed intensities of 0.04 and 20% with respect to the He^+ peak. The peak with a mass number of 9 was assigned to He_2H^+. The addition of 2% hydrogen to the helium led to disappearance of this peak. The peak with a mass number of 12 was assigned to the He_3^+ ion. A series of reactions taking place in the discharge is proposed. (TTT)

46846 SURFACE WAVES ON A UNIAXIAL PLASMA SLAB: THEIR GROUP VELOCITY AND POWER FLOW. Bertoni, H. L.; Hessel, A. (Polytechnic Inst. of Brooklyn, Farmingdale, N. Y.). IEEE (Inst. Elec. Electron. Eng.), Trans. Antennas Propagation, AP-14: 352-9(May 1966).

The relation between group velocity and the velocity of energy transport for surface waves in plane-stratified, anisotropic, dispersive media, which was derived in the preceding report, is verified by direct calculation for the case of surface waves on a uniaxial, cold plasma slab located in free space. A superimposed d-c magnetic field of infinite strength and parallel to the interfaces generates the uniaxial anisotropy in the slab. Surface waves having an arbitrary direction of propagation with respect to the d-c magnetic field are considered. A graphical presentation of the dispersion relation is given, from which the direction of propagation of surface wave rays is directly obtained. It is shown that for the configuration described, the velocity of energy transport of each surface wave is not parallel, in general, to the transverse wave vector, and that the direction, as well as the magnitude, of the real part of the complex Poynting vector varies with the coordinate normal to the slab. Thus the slab configuration provides a nontrivial example of the equality of the surface wave's group velocity and its energy transport velocity. (BBB)

46847 UNIFORMITY OF THE ELECTRON NUMBER DENSITY IN A MERCURY DISCHARGE TUBE. Gregory, B. C. (CSF-CEPEC, Orsay, France). Int. J. Electron., 20: 495-501(May 1966).

The electron density along the positive column of a mercury hot cathode discharge was measured by two methods. The first uses a cylindrical cavity which resonates in a surface wave dipole mode on the plasma. The second uses a TM_{010} cylindrical cavity in which the resonant frequency is perturbed by the plasma. A longitudinal variation of electron density was observed. (M.O.W.)

46848 LASER INTERFEROMETER FOR REPETITIVELY PULSED PLASMAS. Hooper, E. B. Jr.; Bekefi, G. (Massachusetts Inst. of Tech., Cambridge). J. Appl. Phys., 37: 4083-94(Oct. 1966).

A three-mirror laser interferometer for measuring electron densities in repetitively pulsed plasmas is described and analyzed. The instrument has a sensitivity equivalent to a density of $10^{13}/d$ cm^{-3}, where d is the length of the plasma in centimeters. It has a time resolution of a few microseconds. The response of the laser intensity to a changing dielectric (e.g., plasma) is calculated in the quasistatic approximation, and the factors contributing to the finite time response are considered. The analysis applies to laser interferometers in general, as well as to the present instrument. (auth)

46849 NEAR-ULTRAVIOLET AND VISIBLE RADIATION FROM A DYNAMIC PINCH. Goeroeg, I.; Singer, J. R. (Univ. of California, Berkeley). Contracts DA-ARO-D-31-124-G-317 and AF-AIOSR 117-63. J. Appl. Phys., 37: 4141-7(Oct. 1966).

The utility of a magnetically compressed plasma as a high-intensity light source was experimentally investigated in a dynamic pinch. The motion of the confined plasma column was studied both experimentally and theoretically throughout a wide range of parameters. It was found that the peak intensity of the emitted light in the 2000 to 6000 Å spectral region is maximum when the plasma reaches minimum radius at times comparable to the quarter cycle period of the discharge current. When the parameters are adjusted to give this mode of operation, a single high-intensity pulse, lasting approximately 2×10^{-6} sec, is emitted. The peak intensity was greatest with xenon as the filling gas. The absolute intensity of the light emitted from helium, air, argon, and xenon plasmas was also measured. The results indicate that a dynamic pinch arrangement can be employed to obtain peak intensities significantly greater than those available from conventional flashlamps. The time-integrated intensity, however, is limited by the inherently unstable nature of the pinched plasma, which restricts the pulse duration to a few microseconds. (auth)

46850 INDUCTION VELOMETRY IN AN IONIZED GAS. Malliaris, A. C. (Avco Corp., Wilmington, Mass.). Contract AF 33(657)-11310. J. Appl. Phys., 37: 4159-68 (Oct. 1966).

A free jet (diameter $2r_0$) of ionized gas is considered under the influence of a uniform magnetic field B normal to the jet axis. Two appropriately placed electrodes sense the induced potential difference $\Delta\phi$ and the following relation: $\langle u\rangle_0 = \Delta\phi/2r_0B$ is taken as the basis for the experimental determination of $\langle u\rangle_0$ defined as the velocity of the ionized gas averaged over the jet cross section. The experimental conditions and the analytical background are carefully examined. It is found that the necessary requirements are satisfied by the plasma properties, by the geometry of the experiment, and by the external circuitry so that the above relation is approximately valid within ±20% or better, depending on certain restrictive assumptions. Appreciable uncertainties arise from the existence of a gradient in the electrical conductivity of the ionized gas and from difficulties in the determination of r_0. A plasma jet was generated by a radiation-cooled thrustor and four different gases were used at various mass flow rates and power levels so that plasma velocities between 10^5 and 10^6 cm sec^{-1} were available. The observed signals were induced by an a-c magnetic field (60 cps) having an amplitude in the vicinity of 10 G. Concurrently with the measurements necessary for the determination of $\langle u\rangle_0$, two other quantities were measured: the thrust F generated by the jet and the mass flow rate $\dot{m}$ of the gas. For the experiments reported here, the values of $\langle u\rangle_0$ and of $F/\dot{m}$ are expected to agree within a few percent. Accordingly, the straight line: $\langle u\rangle_0 = \alpha + \beta(F/\dot{m})$ is determined by a least-squares fit to the data when $\langle u\rangle_0$ is plotted versus $F/\dot{m}$. For the main group of data it is found that $\alpha = (0.38 \pm 0.24) \times 10^5$ cm/sec and $\beta = 0.94 \pm 0.04$. This is satisfactory within experimental error and within the approximations made. Finally, several auxiliary experimental tests are carried out in order to obtain evidence supporting the approximations made in the main experiments. (auth)

46851 COLD-BEAM-PLASMA INTERACTION THEORY FOR FINITE TRANSVERSE DIMENSIONS AND FINITE MAGNETIC FIELDS. Simpson, J. E.; Dunn, D. A. (Stanford Univ., Calif.). J. Appl. Phys., 37: 4201-7(Oct. 1966).

The dispersion relation for interaction between a cold electron beam and the electrons of a cold, uniform-density plasma of a circular cylindrical cross section and of a radius equal to that of the beam inside a conducting pipe of a larger radius was solved on a computer for a number of values of finite magnetic field, the ratio of plasma density to beam density, and beam perveance. Complete $\omega-k$ diagrams are given for various cases along with more extensive data on the growing wave gain that occurs below the plasma frequency and the cyclotron frequency. A comparison with experimental data on a beam-generated plasma is given, and the theory is shown to provide a satisfactory explanation for the onset of oscillations in such a system with a finite length. (auth)

46852 ION SAMPLING CONSIDERATIONS FOR A DISCHARGE PLASMA OF NITROGEN. Boehme, D. K.; Goodings, J. M. (McGill Univ., Montreal). J. Appl. Phys., 37: 4261-8(Oct. 1966).

A quadrupole mass-spectrometric sampling probe is employed for the study of ion extraction and plasma sheath formation in a discharge plasma of nitrogen at low pressures (9 to 27 μ). The dependence of the specific ion current ratio $i(N^+)/i(N_2^+)$ on the potential of the sampling probe is presented for various pressures and a fixed electron temperature. Kinetic energy distribution curves for individual ionic species are obtained under a variety of conditions of sampling probe potential, pressure, and electron temperature using a retarding potential field applied at the entrance grid of a quadrupole mass filter. Interpretations of the results indicate that ion generation processes and ion-molecule collisions occurring in the sheath may strongly influence the sampling process. (auth)

46853 ACOUSTICAL PLASMA WAVE IN A HOLLOW CATHODE DISCHARGE. Bickel, William S. (Univ. of Arizona, Tucson). J. Appl. Phys., 37: 4300-1(Oct. 1966).

Oscillations were observed in the intensity of the de-excitation light emitted from a He plasma formed by a condensed discharge in a cylindrical hollow cathode source. The period of the oscillations was measured for different size cathodes and for different He pressures. The oscillations are of shallow depth, representing only a 15% change in excited state density. They are also strongly damped, being undetectable after about 70 μsec. Calculations indicate that the oscillations are caused by a radial sound wave. (A.G.W.)

46854 EXPERIMENTAL INVESTIGATION OF HALL PHENOMENA IN LOW-TEMPERATURE PLASMA IN PRESENCE OF EXTERNAL MAGNETIC FIELD CHANGING PERIODICALLY IN SPACE. Kim, K. I.; Chemeris, V. T.; Markovskii, N. V.; Aristov, A. I. Magnit. Gidrodin., No. 2, 39-46(1966). (In Russian).

The results are presented of experimental investigations of Hall phenomena in low-temperature plasma consisting of combustion products with an admixture of KOH in the presence of an external magnetic field changing periodically in the space. The existence of potential drop and consequently of the Hall currents along the duct axis were proved experimentally. This result is in agreement with theoretical data. It was shown experimentally that the conductivity of the duct side walls gives an essential contribution to restriction of Hall phenomena. (auth)

46855 RADIOFREQUENCY-INDUCED GAS PLASMA AT 250-300 kc/s. Floyd, I. J. (Allen Clark Research Centre, Towcester, Eng.); Lewis, J. C.; Bayliss, R. K. Nature, 211: 841-2(Aug. 20, 1966).

Induced plasmas in static gases at atmospheric pressure were investigated. A pilot plasma was established in the megacycle range and power was then coupled into this plasma from a second work coil energized at 280 kc/s. The production of low-frequency plasma using this technique is described. (M.O.W.)

46856 STATUS OF CONTROLLED NUCLEAR FUSION RESEARCH. Mori, Sigeru (Japan Atomic Energy Research Inst., Tokyo). Nippon Genshiryoku Gakkaishi, 8: 431-43(1966). (In Japanese).

The status of controlled nuclear fusion research in the world is reviewed. Problems in developing a steady-state fusion reactor are discussed briefly. A table is presented listing the principal existing installations for fusion research, classified according to location and type, and giving their plasma parameters. A list of fusion research laboratories in Japan is also presented, with information on their principal themes of study. (auth)

46857 PLASMA ELECTRIC NOISE OF A STEADY H-F DISCHARGE IN A MAGNETIC FIELD. Vdovin, V. L.; Rusanov, V. D.; Frank-Kamenteskii, D. A. (Kurchatov Inst. of Atomic Energy, Moscow). Nucl. Fusion, 6: 169-75(Sept. 1966). (In Russian).

The plasma is produced by magneto-acoustic techniques in a glass tube situated in a constant magnetic field. The

plasma flows out continuously along the axis into the measuring chamber at whose center the magnetic field varies from 700 to 2500 Oe. A hydrogen plasma was studied at pressures of (5 to 1) $\times 10^{-3}$ torr. The active high-frequency power put into the discharge was 4 kw. The temperature of the electrons varied from 4 to 10 ev, and the electron concentration at the center of the chamber was 1×10^{10} to 4×10^{12} cm^{-3}. The density of the plasma and the temperature of the electrons were determined mainly by electric probes. Further, the density and temperature of the electrons were checked by a microwave technique (for which the Fabry-Perot interferometer was used) as well as by optical methods. In the range from 10 to 200 kHz, intensive (~1V) electric noise with first-harmonic frequencies of several tens of kHz was discovered and investigated by means of dual electric and capacitative and double capacitative probes. The relation between this noise and the plasma parameters was studied, and discussed from the point of view of the "universal" plasma instability. (auth)

46858 STABILITY OF A SPATIALLY INHOMOGENEOUS CURRENT-CARRYING PLASMA. Bogdankevich, L. S.; Rukhadze, A. A. (Lebedev Inst. of Physics, Moscow). Nucl. Fusion, 6: 176-81(Sept. 1966). (In Russian).

The oscillation spectrum of a spatially inhomogeneous current-carrying plasma is analyzed in conditions where all the plasma electrons are in motion relative to quiescent ions. Along with the density and temperature of the particles, the directed motion of the electrons, i.e., the plasma current, is considered to be inhomogeneous. The analysis shows that in certain cases this directed motion can be a cause of instability in a current-carrying plasma. Criteria are established for the instabilities of such a plasma in various frequency ranges and ways are suggested of averting them. In particular, attention is drawn to a dynamic method of suppressing instabilities by means of the current itself, in conditions where the plasma current is variable in time. (auth)

46859 CROSS SECTIONS FOR COLLISIONS OF ELECTRONS WITH HYDROGEN ATOMS AND HYDROGEN-LIKE IONS. Percival, I. C. (London Univ.). Nucl. Fusion, 6: 182-7(Sept. 1966). (CLM-P-87).

On the basis of a limited critical review of present theory and experiment, cross sections are recommended for the ionization of any level of hydrogen or any hydrogenic ion by electrons, for the excitation of any level from the ground level and $n \rightarrow n + 1$ excitation from higher levels. Individual angular momentum and Stark states of the levels are not considered. A few experimental results for excitation and ionization are relied on, together with theoretical estimates of relative cross sections to obtain recommended cross sections for a variety of processes, which are inaccessible to direct experiment. The normalized energy of the incoming electron is $E = E/U$ where E is the energy of the incoming electron, and U the ionization energy of the atom or ion. A normalized cross section is defined as $Q = (Z/n)^4 Q$ where Z is the nuclear charge, n the initial principal quantum number and Q the cross section. The recommended normalized cross sections for ionization are

$$Q_{R}(E) = \frac{(1{,}19 \ln E + 5{,}26)(E-1)}{E^2 + 1{,}67E + 3{,}57} \pi a_0^2 \quad (Z = 1, n = 1)$$

$$Q_{R}(E) = \frac{[1{,}28n^{-1} \ln (En^{-2}) + 6{,}67](E-1)}{E^2 + 1{,}67E + 3{,}57} \pi a_0^2 \quad (Z = 1, n \geq 2)$$

$$Q_{RZ}(E) = 1 + \left[\frac{2{,}3}{(1 - Z^{-1})^{-2} + 2(E-1)^2}\right] Q_{R(Z=1)}(E)$$

(any Z, any level). The cross section $Q_{R,1\rightarrow n}(E)$ for excitation of neutral hydrogen from the ground level n = 1 to the n = 2 level is presented graphically. The recommended cross section for excitation to an arbitrary final level is

$$Q_{R,1\rightarrow n}(E) = \frac{27}{8(n - n^{-1})^3} Q_{R,1\rightarrow 2}(E + n^{-2} - \tfrac{1}{4}) \quad (Z = 1, \text{any } n)$$

For any excitation of neutral hydrogen from a level $n \neq 1$ to a neighboring level, the cross sections of Saraph are recommended. The recommended cross sections for excitation of the ground levels of ions are more complicated, but are based on the Born cross sections for neutral hydrogen. (auth)

46860 STABILITY OF PLASMA CYLINDER IN A TIME-DEPENDENT MAGNETIC FIELD. Vandakurov, Yu. V. (Institute of Physics and Tech., Leningrad). Nucl. Fusion, 6: 188-99(Sept. 1966). (In Russian).

The stability of an ideally conducting plasma cylinder in a strong, time-dependent magnetic field is studied in the magnetohydrodynamic approximation. When there is no radial movement of particles the configuration is stable (the stability in question is that of a non-rotating plasma column in one longitudinal field, although the current along the cylinder axis and the rotation of the medium are taken into account). The superposition of the time-dependent component of the longitudinal magnetic field may produce the following three types of instability: (1) In a contracting cylinder the long-wave perturbations may become unstable; when this happens the development time is inversely proportional to $(|m| - 1)^{1/2}$, where: m is the perturbation mode. This is an instability of the Rayleigh-Taylor type. The effect is studied by means of a homogeneous plasma column model in which the compression velocity is linearly dependent on the radius and the magnetic pressure distribution is parabolic; (2) In a plasma in which the compression or expansion velocity is of the same order as the thermal speeds, non-radial natural oscillations may build up. In particular, the bands of instability are narrow for cylinder pulsations of small amplitude, while the growth rate is proportional to the amplitude of the pulsations. The most dangerous resonance occurs if the pulsation frequency is close to the sum of the two oscillation frequencies (or twice the frequency of one oscillation); (3) Instability occurs in an inhomogeneous plasma contained by a strong magnetic field on which a parallel field of small amplitude and high frequency is superposed (it is assumed that the frequency is much greater than the ratio of thermal speeds to plasma column radius). The development time of the perturbations is inversely proportional to the amplitude of the alternating field component and decreases abruptly near frequencies exceeding ion cyclotron frequency. In this region a build-up occurs of high-frequency non-radial natural oscillations that are independent of the co-ordinate along the cylinder. The most stable configuration has a uniform density distribution and a sharp boundary, and the growth rates are proportional to the square root of the ratio of the boundary layer thickness to the cylinder radius. It is suggested that the effect considered is the cause of the high level of diffusion observed at the ion cyclotron resonance. (auth)

46861 RADIAL DISTRIBUTION OF PLASMA FORMED IN SIMPLE MIRROR MACHINES BY FIELD IONIZATION OF FAST NEUTRAL ATOMS. Murphy, E. G.; Riviere, A. C.; Sweetman, D. R. (United Kingdom Atomic Energy Authority, Abingdon, Eng.). Nucl. Fusion, 6: 200-6(Sept. 1966). (CLM-P-94).

The radial distribution of plasma which results from field ionization of excited atoms injected into simple mirror machines is calculated and compared with measurements made in the Phoenix machine. The excited atoms are assumed to have a level population distribution given by An^{-3} where n is the principal quantum number. The fraction of the atoms ionized per unit interval along their path is obtained by calculating the quantum mechanical barrier penetration probability at each point. Finite Larmor orbit diameter, precessional drift around the field axis, and finite atom beam dimensions are taken into account in obtaining the radial distribution of plasma that results from this method of injection. The plasma distribution rises to a maximum on the axis in contrast to the distribution obtained by assuming that ionization occurs immediately when a critical field is reached. Good agreement with experiment is obtained both for the absolute density and for radial distributions. The fraction ionized per unit interval at the axis is calculated for the Alice and Ogra II experiments without their stabilizing fields; this fraction is approximately proportional to the square root of the radial field gradient coef-

ficient. However, the fraction ionized per unit interval is also calculated for an artificial flat-topped field shape and the results show that even in the absence of field gradient, useful trapping can be obtained. Calculations are also made of the effect of preionization on the radial extent of the plasma. (auth)

46862 ELECTROSTATIC STABILITY OF GYRATING ELECTRON STREAMS. Canobbio, E. (CEN de Saclay, Gif-sur-Yvette, France). Nucl. Fusion, 6: 207-11(Sept. 1966).

Two wide classes of velocity distribution functions suitable for confinement in "open-ended" containment fields may lead to electrostatic (linear) instability of an infinite homogeneous plasma in a uniform magnetic field. They are the anisotropic distributions with a preponderance of the particle energy being directed perpendicular to the magnetic lines (distributions which may also be set up by such situations as resonant heating, charge exchange losses, and energetic particle injection) and the double streams resulting from the axial oscillations of the trapped particles between two magnetic mirrors. A plasma constituted by electrons which spiral around the magnetic lines of force with a large (but not relativistic) perpendicular velocity and by ions which move almost axially is considered in particular the effects associated with the finite radius of the streams. The discussion of the stability of such a system is of some relevance to the injection and accumulation experiments in progress at Saclay in the Plĕiade and Circé machines. The validity of the electrostatic approximation is investigated. (auth)

46863 DISSOCIATION OF H_2 + IONS BY THE LORENTZ FORCE. Dei Cas, R.; Fumelli, M.; Girard, J. P.; Prevot, F.; Valckx, F. P. G. (CEA, Fontenay-aux-Roses, France). Nucl. Fusion, 6: 212-14(Sept. 1966). (In French).

In the plasma experiment of H_2^+ ion injection into a magnetic mirror (MMII) at Fontenay-aux-Roses, Lorentz force trapping is observed when the residual gas pressure is low enough. The measured dissociation fraction of H_2^+ directly extracted from the ion source is relatively high, $f \sim 2 \times 10^{-4}$, for an equivalent electric field maximum $E = 3.2 \times 10^4$ V/cm. This result is attributed to the abundance of ions with high vibrational levels. (auth)

46864 CONVECTIVE AND ABSOLUTE INSTABILITY. Dysthe, K. B. (Univ., Bergen). Nucl. Fusion, 6: 215-22 (Sept. 1966).

Unstable systems characterized by linear partial differential equations with constant coefficients are considered. The question of convective or absolute instability has meaning only for a stated condition; then the Cauchy problem for the system is solved by Fourier and Laplace transforms. For one space dimension, we start from the solution which is written as a Laplace inversion integral, and evaluate it asymptotically ($t \to \infty$). For several space dimensions we start from a solution of the Cauchy problem that is written as a Fourier integral; this solution is evaluated asymptotically by the saddle point method. Six criteria distinguish between the two types of instabilities. The first is equivalent to the criterion found by Sturrock, and applies only to systems propagating in one space dimension. The fifth is more general because it applies to one or more space dimensions. The second and sixth give sufficient conditions for convective instability. The third and fourth give sufficient conditions for absolute instability. The "bulk" of the growing wave is defined to be the part of it having the highest growth rate. The velocity associated with the bulk of the wave is calculated for unstable systems satisfying the stated condition. This velocity may be zero for an absolutely unstable system. (auth)

46865 RADIAL IMPLOSION OF A PARTIALLY IONIZED PLASMA IN A THETA PINCH. Green, T. S.; Newton, A. A.; Segre, S. E. (United Kingdom Atomic Energy Authority, Abingdon, Eng.). Nucl. Fusion, 6: 223-7(Sept. 1966). (CLM-P-93).

The radial implosion of a deuterium plasma in a theta pinch was investigated in which the initial level of ionization was controlled. Measurements of the diamagnetism of the plasma during the implosion were related to the mass of gas in motion. The latter depends on the interaction between the ions and the neutral atoms. The effective cross-section for momentum transfer from ions to neutrals is 4×10^{-15} cm^2, close to the charge exchange cross-section for protons and hydrogen atoms. (auth)

46866 FLUX OF D^+ IONS WITH PLEIADE. Bardet, R.; Consoli, T.; Consolino, J.; Geller, R.; Gormezano, C.; Jacquot, B. (CEA de Saclay, Gif-sur-Yvette, France). Nucl. Fusion, 6: 228-30(Sept. 1966). (In French).

A method is described for measuring fluxes of deuterons with energies over 20 kev. The method relies on the detection of alpha particles from the T(d,n)^{4}He reaction produced by the bombardment of a tritiated titanium target. The experimental results obtained with a mixed-field (static magnetic + h-f) acceleration called Plĕiade are described. (auth)

46867 CRITICAL VOLTAGE OF A ROTATING PLASMA. Lehnert, B.; Bergstroem, J.; Holmberg, S. (Royal Inst. of Technology, Stockholm). Nucl. Fusion, 6: 231-8(Sept. 1966).

The accessible voltage levels were determined for a rotating plasma device in which the confinement region surrounds a ring-shaped coil that is suspended by a single rod. There exists a sharply defined critical voltage and a corresponding velocity limit which cannot be exceeded by a moderately large power input. This is clearly shown with the present apparatus where the plasma voltage slowly approaches the critical level from below and where the insulator consists only of a narrow rod. The critical voltage increases with the mean radial ratio r_0/r_w in the plasma. This ratio is defined by a magnetic field line which intersects the midplane of the device at a radial distance r_0 from the axis of symmetry, and cuts the end insulator at the corresponding distance r_w. The results can be explained by an interaction between the plasma and a neutral gas layer at the insulator surface that limits the velocity to the critical value v_c earlier introduced by Alfvén. As a consequence, the velocity limit becomes $(r_0/r_w)v_c$ in the equatorial plane. Deductions of the corresponding voltage limit agree with the experiments. The plasma is heavily disturbed even by a very small obstacle which is introduced in the equatorial plane. This indicates that the losses of the system are small under normal operation. So far the stability is not influenced by the fact that most of the field lines pass freely around the confinement region and do not end upon an insulator surface. (auth)

46868 MEASUREMENTS OF THE CHARGED PARTICLES OF AN EQUILIBRIUM TURBULENT PLASMA. Guthart, H.; Weissman, D. E.; Morita, T. (Stanford Research Inst., Menlo Park, Calif.). Phys. Fluids, 9: 1766-72(Sept. 1966).

A pair of diagnostic techniques for the measurement of the statistical properties of the ionized particles of an equilibrium turbulent plasma were developed including an electrostatic probe and a high-resolution microwave probe. The turbulent plasma is formed by seeding a premixed ethylene-oxygen flame in a combustion chamber and then exhausting through an expansion nozzle into a low-pressure vessel. The power spectral density of the fluctuations of the electrons and ions is measured. The electron and ion fluctuations are observed to have the identical spectrum. The ion density correlations in space and space–time were measured throughout the plasma volume. The distribution of the mean and rms values of the electron density throughout the volume is also presented. It is concluded that on the axis of the hot jet exhaust the turbulent eddy pattern is approximately isotropic and frozen. (auth)

46869 PERTURBATION THEORY FOR STRONG PLASMA TURBULENCE. Dupree, T. H. (Massachusetts Inst. of Tech., Cambridge). Phys. Fluids, 9: 1773-82 (Sept. 1966).

A new perturbation theory for solving the Vlasov equation is derived. The theory is especially designed to cope with time secularities and nonanalyticity in the expansion parameter (the field strength). The method is based on the

use of a statistical set of exact particle orbits instead of the unperturbed orbits conventionally used in perturbation solutions of the Vlasov equation. A principal result of the theory is a modification of the particle–wave interaction and a "broadening" of the associated resonant denominator $(\omega - k\cdot v)^{-1}$. The nature of the time secularities associated with the streaming modes exp ik·vt is discussed. A simple application to velocity-space diffusion and trapping and its effect on wave growth is described. (auth)

46870 THREE-DIMENSIONAL NORMAL MODES OF MAGNETIZED VLASOV PLASMA. McCune, J. E. (Massachusetts Inst. of Tech., Cambridge). Phys. Fluids, 9: 1788-97(Sept. 1966).

The three-dimensional velocity-space eigenmodes of the linearized Vlasov equation for an electronic plasma, imbedded in a uniform applied magnetic field, are derived in the electrostatic limit and are shown to be complete. In general, a continuum of modes exists (except for $k\cdot B_0 = 0$) and, if the plasma is unstable, and additional set of discrete modes appears. It is found that a particular functional of the undisturbed distribution function plays a role (for $k\cdot B_0 \neq 0$) analogous to Case's $\eta(v)$ in establishing the properties of the modes. For the case $k\cdot B_0 = 0$, which must be treated separately, two discrete sets of modes exist, only one of which contributes to the density and field fluctuations in the electrostatic approximation. (auth)

46871 COLD-PLASMA EFFECTS IN FINITE-LENGTH PLASMAS. Guest, G. E.; Beasley, C. O. Jr. (Oak Ridge National Lab., Tenn.). Contract W-7405-eng-26. Phys. Fluids, 9: 1798-1804(Sept. 1966). (ORNL-P-2027).

Criteria are derived for the relative cold-plasma density necessary to stabilize the grad B drift waves in finite-length energetic plasmas separated from grounded conducting end plates by a cold plasma. For a dense ($\omega_{pi}^2 \gg \omega_{ci}^2$) hot-electron plasma in which the electron precession frequency, $\omega_{ge} \ll \omega_{ci}$, the ion gyrofrequency, it is found that $(N_{cold}/N_{hot})_{critical} \sim 2l^2(\omega_{ge}/\omega_{ci})(L_h L_c/2R_p^2)m/M$, where $k_\perp = l/R_p$. If $l\omega_{ge} \sim \omega_{ci}$, the corresponding criterion is very roughly given by $(N_{cold}/N_{hot})_{critical} \sim (l^2/\delta)(L_h L_c/2R_p^2)(m/M)$ where $0 < \delta = 1 - (l\omega_{ge}/\omega_{ci}) < 1$. For hot-ion plasmas, a two-dimensional stability diagram is given which predicts a high-density stable regime for small ratios of N_{cold}/N_{hot}. A tentative comparison with thresholds observed in several experiments is made. (auth)

46872 ANALYSIS OF THE DIELECTRIC CONSTANT OF A TWO-TEMPERATURE PLASMA. Klevans, E. H.; Primack, J. R. (California Inst. of Tech., Pasadena). Phys. Fluids, 9: 1805-13(Sept. 1966).

The dielectric constant of a homogeneous, fully ionized two-temperature plasma was investigated to determine: (1) the conditions under which ion waves will be found; (2) accurate values for the phase velocity and damping rate of the ion waves; (3) the validity of approximate expressions for the ion wave phase velocity and damping; (4) the behavior of the dynamic shielding factor when ion waves are possible. (auth)

46873 OBSERVATION OF COLLISIONLESS ELECTRON HEATING BY ION CYCLOTRON WAVES. Yoshikawa, S.; Yamato, H. (Princeton Univ., N. J.). Phys. Fluids, 9: 1814-21(Sept. 1966). (MATT-407).

Electron heating is observed on application of the ion cyclotron wave in the C stellarator. The observed heating rate is an increasing function of the electron heating, suggesting that the heating is not due to the simple collisional process. The observed heating rate is consistent with the theoretical heating rate due to Landau damping of the wave by the resonant electrons. The generation of a d-c electric current was observed when the wave was allowed to propagate in one direction, suggesting that the momentum of the wave is transmitted to electrons by Landau damping. The quasilinear treatment of the current generation is compared with the observed current generation. (auth)

46874 RANDOM PHASE APPROXIMATION FOR A PLASMA IN AN EXTERNAL ELECTRIC FIELD. Livingston, P. M. (Catholic Univ. of America, Washington, D. C.). Phys. Fluids, 9: 1822-5(Sept. 1966).

A new method for establishing the perturbed electron distribution in an oscillating external, homogeneous electric field is demonstrated. A Green's function for single-particle motion in the external field is averaged over a random distribution of starting phases. It is shown that in time intervals longer than the period of the field, acceleration effects are dropped, and one finds a simple Laplace transform of the averaged Green's function. The latter remains a function of the electric field, however, and when written in the solution of the linear Vlasov equation, gives a distorted electron distribution in the electric field directions. If a Lorentz model for the initial electron distribution is considered, the zeros of the dielectric function show the plasma to be stable if $(eE/m_e\omega_0 v_0) \leq (2/3\sqrt{3})$, $\omega_0 > \omega_p$, where v_0 is the half-width of the distribution, ω_0 and E are the field frequency and intensity, respectively. (auth)

46875 COMPUTER EXPERIMENT OF ANOMALOUS DIFFUSION. Hockney, R. W. (Stanford Univ., Calif.). Phys. Fluids, 9: 1826-35(Sept. 1966).

A computer model of the diffusion of a fully ionized plasma across a constant magnetic field is described. The two-dimensional motion of one thousand charged rods is followed as they move according to Newtons law of motion under the action of their mutual electrostatic forces. A square region is considered which is perpendicular to a constant magnetic field. Plasma rods are injected thermally from one side of the square, and the transport of rods to the opposite side is observed. The model is virtually collisionless, and the observed diffusion can be attributed to the effect of the coherent electric field arising from the spontaneous growth of plasma instabilities. The magnitude of the diffusion is given by the Bohm drain diffusion formula. The dominant instability is an m = 1 drift wave which occurs when the electron drift motion is in synchronism with an electrostatic ion wave. The results of the calculation have been displayed in a short two-minute movie which shows the time variation of the potential surface. (auth)

46876 TURBULENT DIFFUSION IN PENNING-TYPE DISCHARGE. Thomassen, K. I. (Stanford Univ., Calif.). Phys. Fluids, 9: 1836-42(Sept. 1966).

Anomalous diffusion arising from a low-frequency flute instability is investigated in a Penning discharge. Theory and experiment on the instability are compared, and measurements of the turbulent fields are used to determine statistical transport rates. Finally, a small magnetic well is created with Ioffe bars to suppress the instability and lower the loss rate. (auth)

46877 CONFINEMENT OF A CESIUM PLASMA IN A MIRROR FIELD. D'Angelo, N.; Goeler, S. v. (Princeton Univ., N. J.). Phys. Fluids, 9: 1843-5(Sept. 1966).

Confinement of a thermally-ionized cesium plasma was investigated in a magnetic mirror geometry. The mirror ratio R was varied continuously between 1 and 5.7. The observed confinement of the plasma can be accounted for in terms of resistive diffusion and ion recombination at the end plates of the Q device. "Bohm" diffusion appears to be inoperative in the conditions of the experiment. (auth)

46878 COMPUTATION OF HYDROMAGNETIC EQUILIBRIA WITH FINITE PRESSURE IN MINIMUM-B SYSTEMS. Killeen, John (Univ. of California, Livermore); Whiteman, Kenneth J. Contract W-7405-eng-48. Phys. Fluids, 9: 1846-52(Sept. 1966). (UCRL-12498).

The distortion of a magnetic well in a minimum-B system by a plasma is calculated. The equations of hydromagnetic equilibria with a tensor pressure are used. The pressure tensor is assumed to be a function of B only. The axisymmetric case is considered in detail by using a stream function for the magnetic field. The resulting partial differential equation is solved by finite-difference methods. Numerical solutions are presented for the stuffed-cusp configuration. The effect of increasing the magnitude of the plasma pressure is discussed. (auth)

46879 UNSTABLE TRANSVERSE WAVES IN A PLASMA WITH ANISOTROPIC ION DISTRIBUTION. Wu, Ching-

Sheng (California Inst. of Tech., Pasadena). Phys. Fluids, 9: 1852-6(Sept. 1966).

The unstable transverse waves in an anisotropic multicomponent plasma are studied. Stability criteria are first established, and then it is shown that the anisotropic ion distribution may result in instabilities even if the electrons have isotropic distribution. (auth)

46880 EFFECT OF A TIME-VARYING TRANSVERSE MAGNETIC FIELD ON THE EQUILIBRIUM OF A TOROIDAL PLASMA. Kessler, John O.; Sinclair, Rolf M. (Princeton Univ., N. J.). Contract AT(30-1)-1238. Phys. Fluids, 9: 1856-9(Sept. 1966). (MATT-354).

Experiments are described in which a localized magnetic field $B_T(t)$ could be suddenly applied transverse to the main plane of the C stellarator. Under optimum conditions the plasma temperatures and decay times were similar to those obtained by conventional means. The field $B_T(t)$ was used to demonstrate that a sudden change in the plasma equilibrium conditions is directly correlated with sudden changes of the plasma impedance. An explanation of this phenomenon in terms of macroscopic drift motions of the plasma is suggested. (auth)

46881 POLOIDAL HYDROMAGNETIC PLASMA-SPHERIC RESONANCES. Carovillano, R. L. (Boston Coll., Chestnut Hill, Mass.); Radoski, H. R.; McClay, J. F. Phys. Fluids, 9: 1860-4(Sept. 1966).

Under conditions of axisymmetry, the vector hydromagnetic wave equation of an infinitely conducting, stationary plasma permeated by a magnetic dipole field decouples into independent toroidal and poloidal modes. A general treatment is provided of the poloidal mode for a wide variety of radial and latitude-dependent plasma densities. A harmonic decomposition of the poloidal wave equation is made, resulting in radial equations which are coupled except for the special case where the Alfvén speed is latitude independent. Exact solutions are obtained in the latter case, and these are used to provide a general solution to the coupled equations for the general case. The method is applied to a model plasma confined between spherical surfaces concentric with the dipole. Resonance periods are calculated for the separable case with various positions of the outer plasma boundary. Periods are also obtained for a spherically symmetric density, and an evaluation of earlier approximate studies of this case is made. (auth)

46882 OBSERVATIONS ON THE VELOCITY OF MOVING STRIATIONS. Alexeff, I.; Jones, W. D. (Oak Ridge National Lab., Tenn.). Contract W-7405-eng-26. Phys. Fluids, 9: 1871-2(Sept. 1966). (ORNL-P-2075).

At very low gas pressures the observed striation velocity is approximately equal to the ionic-sound-wave velocity of Tonks and Langmuir. At higher pressures it decreases with increasing pressure. As very low pressure is approached, the striations abruptly reverse their direction of propagation. (auth)

46883 APPROXIMATE CALCULATION OF THE SPEED OF SOUND IN A PLASMA. Ahlborn, Boye (Univ. of British Columbia, Vancouver, Can.). Phys. Fluids, 9: 1873-4(Sept. 1966).

The speed of sound in a plasma is approximately calculated for known values of enthalpy, density, and pressure. (auth)

46884 EXPERIMENTALLY MEASURED VELOCITY DISTRIBUTION IN THE PLASMA STREAM OF A PULSED COAXIAL ACCELERATOR. Karras, T. W.; Gorowitz, B.; Gloersen, P. (General Electric Space Sciences Lab., King of Prussia, Pa.). Contract NASw-1044. Phys. Fluids, 9: 1874-6(Sept. 1966).

Measurements of the ion velocity distribution in a pulsed plasma stream were performed. Agreement was found with the average velocity as computed from momentum transfer and mass flow measurements. (auth)

46885 NON-CONVECTIVE CYCLOTRON RESONANCE INSTABILITIES. Cordey, J. G. (United Kingdom Atomic Energy Authority, Culham, Eng.). Phys. Lett., 23: 228-9 (Oct. 17, 1966).

It is shown that a particular class of ion cyclotron resonance instabilities are non-convective. (auth)

46886 INVESTIGATION OF PLASMA RADIATION EXCITED BY PHOTONS. Steinmann, W.; Hofmann, J.; Stettmaier, K. (Univ., Munich). Phys. Lett., 23: 234-5(Oct. 17, 1966).

The diffuse emission of photon excited plasma radiation from Ag is not a fluorescence phenomenon [Phys. Rev. Letters, 15(1965) 882]. It may be explained by plasmon-phonon scattering. This radiation was measured in the plane perpendicular to the plane of incidence both in transmission and reflection. (auth)

46887 INTENSE PULSED SOURCES OF LASER-PRODUCED IONS AND ELECTRONS. Bourrabier, C. (Centre de Recherches de la CSF, Corbeville, France); Consoli, T.; Slama, L. Phys. Lett., 23: 236-7(Oct. 17, 1966). (In French).

Plasma blobs are produced by focusing a laser beam unto a solid target. After acceleration the plasma is analyzed. The extracted ionic or electronic currents characteristics are given. (auth)

46888 EVIDENCE FOR LANDAU DAMPING OF TONKS-DATTNER RESONANCES. Huggins, R. W.; Raether, M. (Univ. of Illinois, Urbana). Contract DA-28-043-AMC-00073(E). Phys. Rev. Lett., 17: 745-7(Oct. 3, 1966).

The modes of oscillation of a warm, inhomogeneous plasma column commonly referred to as the Tonks–Dattner resonances were investigated. An explanation was earlier given for the anomalously large linewidths observed from the plasma. The explanation is based on the fact that Landau damping is greatly enhanced in inhomogeneous plasmas and may become the dominant line broadening mechanism for the Tonks-Dattner modes. Measurements which support this explanation are described. (M.O.W.)

46889 ONE METHOD OF DECREASING THE GAS DISCHARGE PLASMA NOISES. Kononenko, K. I.; Movchan, S. P.; Yatsenko, A. I. Radiotekhn. Elektron., 10: 2273-5(Dec. 1965). (In Russian).

An attempt was made to reduce plasma current noise generated in the gas discharge pre-cathode area with high positive ion density. It was found that the gas discharge noise level was reduced about 4-fold by reduced electrode potential (the screen) to −15 v; the noise was directly proportional to the magnitude of the discharge current. (R.V.J.)

46890 RECENT DEVELOPMENTS IN THE STATISTICAL MECHANICS OF PLASMAS. DeWitt, Hugh (Univ. of California, Livermore). pp 135-47 of Symposia on Theoretical Physics. Vol. 2. Ramakrishnan, Alladi (ed.). New York, Plenum Press, 1966.

A review is presented of recent work in the application of modern methods of the quantum-mechanical many-body problem to the statistical mechanics of plasmas. The approach is entirely microscopic and is not easily described with field theory methods, in contrast to the macroscopic approach of MHD's, a continuum theory. The specific problems considered are: the equation of state, electrons in metals, oscillations, bremsstrahlung, relaxation toward thermal equilibrium, and transport coefficients. (M.O.W.)

46891 INVESTIGATION OF HIGH-TEMPERATURE PLASMA BY THE METHOD OF COLLECTIVE VARIABLES. I. Yukhnovskii, I. R.; Blazhievskii, L. F. Ukr. Fiz. Zh., 11: 936-45(1966). (In Ukrainian).

On the basis of a previously obtained expression for the statistical sum of an equilibrium plasma $Z = \int (d\rho) e^{U(\rho)} Sp\,[J(\rho r)\sigma(\rho r)] = \int (d\rho) e^{U(\rho)} J^0(\rho) Sp\sigma + \ldots$ the corrections (due to the statistics of the system) to the thermodynamic potential of an electron gas in a compensating field are computed. The result is an expansion by powers $\varkappa\lambda = (\beta\hbar\sqrt{4\pi ne^2/m})$, $\varkappa\lambda \ll 1$. The problem of the intrinsic energy is discussed. (auth)

46892 EFFECTIVE CROSS SECTION FOR ELECTRON SCATTERING IN HELIUM AND ARGON PLASMA WITH

CESIUM VAPOR ADMIXTURE. Polushkin, I. N.; Dudko, D. Ya. Ukr. Fiz. Zh., 11: 950-6(1966). (In Ukrainian).

The effective cross section of electron scattering by neutral atoms of a binary gas-discharge plasma in the inert gases He and Ar at a pressure of ~2 mm Hg with an admixture of Cs vapor was measured. The measurements were made by two methods — that of a superhigh frequency resonator in the three-centimeter band and that of plasma conductivity in a direct current circuit. The electron scattering cross section equals, according to these measurements, 6×10^{-16} cm^2 for plasma in He, 2×10^{-16} cm^2 for plasma in Ar, and 2×10^{-14} cm^2 for plasma in Cs. Dependences of the electric field strength and conductivity of plasma in He–Cs and Ar–Cs on the Cs vapor pressure are given for various electric current densities. (auth)

46893 EFFECT OF SMALL MAGNETIC FIELDS ON THE PROPERTIES OF A THERMIONIC DIODE IN AN AUTONOMOUS DISCHARGE PLASMA. Korchevoi, Yu. P. Ukr. Fiz. Zh., 11: 957-62(1966). (In Ukrainian).

It is shown that turning on small (H = 0 to 200 e) longitudinal and transverse magnetic fields leads to a rise in the emf of ϵ and the optimal output voltage V_m of a thermionic diode located in an autonomous mercury discharge plasma. Probe measurements showed that the increase in ϵ and V_m on turning on the magnetic field is chiefly due to the rise in the electron temperature of the plasma. (auth)

46894 A VALVE FOR PULSED GAS INJECTION INTO THE WORKING SPACE OF A COAXIAL PLASMA GUN. Belikov, A. G.; Goncharenko, V. P.; Slavnyi, A. S. Ukr. Fiz. Zh., 11: 963-70(1966). (In Ukrainian).

It is well known that the working regime of a coaxial plasma gun is determined by the time delay between the moment of starting the valve battery and the moment the voltage is applied to the gun terminals. In other words the working regime of the gun is determined by the amount of gas entering into the gun annulus space before the discharge can take place. So, knowledge of the valve characteristics is very important. The valve characteristics and the methods of their measurement are described. (auth)

46895 ELECTRON INJECTION INTO AN ELECTROMAGNETIC TRAP. Lavrentev, O. A.; Ovcharenko, L. I.; Safronov, B. G.; Sidorkin, V. A. Ukr. Fiz. Zh., 11: 982-90(1966). (In Ukrainian).

The conditions of low-density electron beam capture in an electromagnetic trap were investigated. The position and dimensions of the cathode were determined so as to secure the most effective injection of electrons. The life of the electrons in the trap were measured and compared for the cases of magnetic and electromagnetic confinement of the plasma electrons. The mean neutral atom ionization and excitation energy loss by the electron was determined. The coefficient of magnetic field diffusion of the electrons as a result of collision with neutral atoms was measured. It is shown that with a magnetic field strength exceeding a certain critical value the escape of electrons from the trap was conditioned by diffusion processes only. (auth)

46896 PECULIARITIES OF DISCHARGE FORMATION IN CROSSED ELECTRIC AND MAGNETIC FIELDS. Reikhrudel, E. M.; Shcheretov, E. P.; Isakaev, E. Kh. Vestn. Moskov. Univ., Ser. III, Fiz. Astron., No. 1, 126-7(Jan.-Feb. 1966). (In Russian).

Peculiarities of a discharge forming in a cylindrical magnetron with a cold cathode in high vacuum were studied. The scheme of the experimental tube is shown and typical curves are given for the dynamics of the discharge rise as a function of various parameters. (R.V.J.)

46897 MAGNETOHYDRODYNAMIC WAVE PROPAGATION IN ANISOTROPIC PLASMAS. Wilhelm, J.; Winkler, R. (Ernst-Moritz-Arndt-Univ., Griefswald, Ger.). Wiss. Z. Ernst-Moritz-Arndt-Univ. Griefswald, Math.-Naturwiss. Reihe, 14: 109-19(1965). (In German).

The propagation of magnetohydrodynamic waves of small amplitude was studied for cases where the gyration frequency is greater than the mean collision frequency, which is greater than the wave frequency. The anisotropy affects the electric current density, the energy current density, and the friction tensor, the generalized Ohm's and Fourier's law is developed from thermodynamics of irreversible processes. The continuum treatment gives values for electric and thermal conductivity and the method for evaluation of friction pressure, giving results in fair agreement with the kinetic method. The case is generalized from that in which anisotropy affects electrical conductivity. In the most general case the magnetoacoustic waves vibrate in a plane determined by the direction of propagation and the magnetic field, with individual component coefficients determined by the anisotropy. Alfven waves do not exist in anisotropic plasmas, except in the limiting case where magnetic field and direction of propagation are parallel. Parallel and perpendicular to the magnetic field there are entropy waves, magnetohydrodynamically determined sound waves, hydrodynamic shear waves, magnetic shear waves, and magnetoacoustic waves. (BBB)

46898 APPLICATION OF UHF DIAGNOSTIC TECHNIQUES TO THE INVESTIGATION OF THE STRUCTURE OF SHOCK WAVES. Ipatov, V. A.; Kalmykov, S. G. (Ioffe Inst. of Physics and Tech., Leningrad). Zh. Tekh. Fiz., 36: 981-7(June 1966). (In Russian).

A microwave interferometer was employed to measure the electron density distribution in a shock front. The shock waves were produced in a 4 cm diameter quartz tube containing argon at approximately 0.01-mm Hg by discharging a 50-kv 12-microfarad capacitor through a two-turn conical winding at one end of the tube. Electrode erosion was avoided only by employing high-grade steel for the winding and carefully preparing its surface. The apparatus was baked out and was purified by repeated discharges, after each of which it was pumped down to 10^{-6} mm Hg. A transverse magnetic field up to 14 kOe, uniform within 3% over the 10-cm-long working region, was provided by discharging a 5-kv 1.05-microfarad capacitor through two rectangular windings. The velocity of the shock front was derived from the cutoff times of two parallel microwave beams 4 cm apart that crossed the shock tube at right angles to its axis. The 8 mm wavelength microwave interferometer was located midway between the two microwave beams employed to measure the shock wave velocity. The transmitting and receiving antennas were identical; each consisted of a horn and a 7-cm-diameter hyperbolic double convex paraffin lens that focused the beam onto the axis of the shock tube. The local lengths of the two surfaces of each lens were 4 and 12.5 cm, respectively. The electron density was calculated from the phase shift of the transmitted beam. The resolving power of the interferometer in the axial direction was determined by moving a 3 cm diameter metal cylinder through the shock tube and observing the change with the position of the cylinder of the intensity of the transmitted beam; the resolution was found to be approximately 1 cm. In deriving the electron density from the interferometer data it was assumed that the electron density was constant in a coordinate system moving with the shock front and could be represented by a trapezoidal distribution function. The velocity of the shock front was about 10^7 cm/sec at 0.045 mm Hg; the velocity increased slightly with increasing voltage on the capacitor and decreased somewhat with increasing strength of the transverse magnetic field. The velocity was nearly 10^8 cm/sec at 0.064 mm Hg, but the reproducibility was poor. The width of the shock front, defined as the distance in which the maximum electron density increased from 10^{12} to 1.7×10^{13} cm^{-3}, increased rapidly with increasing velocity of the shock wave, and under some conditions it was as great as 20 cm. The width of the shock front decreased somewhat with increasing transverse magnetic field strength, but the width was definitely not limited by the electron Larmor radius. It is concluded that further experiments are desirable to eliminate the necessity for the arbitrary assumption of a trapezoidal electron density distribution, and that the microwave interferometer is a useful tool for measuring rapidly changing electron densities with a spatial resolution in the neighborhood of 1 cm. (ATD)

46899 RESONANCE ABSORPTION OF ENERGY FROM LOW-FREQUENCY OSCILLATIONS BY A COLD NON-

UNIFORM PLASMA. Dolgopolov, V. V.; Stepanov, K. N. Zh. Tekh. Fiz., 36: 1003-7(June 1966). (In Russian).

The propogation in the axial direction of low-frequency electromagnetic waves in a cold radially nonuniform plasma cylinder in a longitudinal magnetic field is discussed, with particular reference to the resonance region where the square of the refractive index is approximately equal to the r-r component (in cylindrical coordinates r, Θ, z) of the dielectric tensor. The plasma is assumed to be dense (the Langmuir frequency high compared with the Larmor frequency) and the wave frequency is assumed to be low compared with the ion Larmor frequency. The plasma is described by the usual expression for the dielectric tensor in terms of the ion and electron Langmuir, Larmor, and collision frequences. Different approximation techniques are employed to solve Maxwell's equations inside and outside the resonance region, and expressions are derived for the energy lost to the plasma by interaction of the plasma with the radial, azimuthal, and longitudinal components of the electric field of the wave. The case when the radius of the plasma cylinder is of the order of the wavelength is discussed in some detail. Depending on the relative magnitudes of the ion and electron collision frequencies and the wave frequency, the absorbed energy can either heat both the electron and ion components of the plasma, or only the electron component. The plasma electrons are heated by the longitudinal component of the electric field, and the ions, by the radial component. The proportionality of the power absorbed by the plasma to the square of the current in the exciting windings is explained, and it is noted that the theoretical results of M. P. Vasil'yev et al. (ZhTF, 34, 974, 1231, 1964) for the case of purely Coulomb collisions when the wave frequency is close to the ion Larmor frequency are correct only in order of magnitude. (ATD)

46900 ELECTROMAGNETIC PROPERTIES OF A SEMI-INFINITE PLASMA WITH DIFFUSE REFLECTION OF ELECTRONS AT THE BOUNDARY. Miroshnichenko, V. I. Zh. Tekh. Fiz., 36: 1008-16(June 1966). (In Russian).

The propogation of electromagnetic waves on the surface and the reflection of them from the surface of a semi-infinite plasma with a plane boundary under conditions of low space dispersion (electron thermal velocities small but not entirely negligible compared with the phase velocity of the waves) and diffuse reflection of the plasma electrons from the plasma surface are discussed. The calculations are based on Maxwell's equations and an expression for the current, which, it is asserted, can be obtained from a solution of the equation for the electron distribution function under conditions of diffuse reflection of the electrons from the plasma boundary. The equations are subjected to a Fourier transformation with respect to time, t, under the condition that the electric field of the wave vanishes outside the plasma, and calculation of the Fourier components is reduced to solution of a Hilbert boundary problem in the complex t-plane. An expression is derived for the impedance of the plasma, and from it there is obtained the dispersion equation for the surface waves and a formula for the reflection coefficient for electromagnetic waves incident at an arbitrary angle on the plasma surface. The surface waves are found to be damped by the Landau mechanism, the damping constant being a linear function of the electron thermal velocity. There is no "surface wave" described by the dispersion equation $\underline{k}^2 = 0$; the contrary conclusion of A. Ts. Amatuni (Zhur. Tech. Fiz., 34, 1354, 1964), it is suggested, was based on the unwarranted assumption that the Fourier component of the current decreases exponentially. The rate of absorption of the energy of an electromagnetic wave incident on the plasma surface is found to be proportional to the thermal velocity of the plasma electrons. (ATD)

46901 ON THE OSCILLATIONS OF A NONUNIFORM WEAKLY IONIZED CURRENT-CARRYING PLASMA IN AN EXTERNAL MAGNETIC FIELD. Lovetskii, E. E. Zh. Tekh. Fiz., 36: 1017-20(June 1966). (In Russian).

The stability of electromagnetic oscillations in a nonuniform weakly ionized plasma in external electric and magnetic fields is discussed. The external fields are assumed to be parallel to the z-axis of a Cartesian coordinate system x, y, z, and the external field strengths and the plasma density are assumed to depend only on x. The calculations are based on the two-fluid hydrodynamic model of a cold plasma with collisions between the charged particles and neutral atoms taken into account. The dispersion equation is derived in the geometric optics approximation and is discussed for different cases in which the Larmor frequency of the current carriers (the electrons in the case of an electron-ion plasma) is high compared with the collision frequency and the frequency $f' = f - k_z v$, where f is the wave frequency, k_z is the z component of the wave vector, and v is the drift velocity in the electric field of the current carriers. The dispersion equation valid when the Larmor frequencies of both plasma components are high compared with f′ and the collision frequencies is employed to discuss the stability both of an electron-ion plasma, and of the electron-hole plasma within a semiconductor. Stability conditions and formulas for the logarithmic increments of the unstable oscillations are derived. It is shown that instability can arise as a result of an x-dependence of the plasma density, of the magnetic field strength, or of the drift velocity of the current carriers, and that the unstable frequency. (ATD)

46902 INSTABILITY OF A HIGH-FREQUENCY DISCHARGE IN A MAGNETIC FIELD. Perel, V. I.; Pinskii, Ya. M. Zh. Tekh. Fiz., 36: 1021-6(June 1966). (In Russian).

The possible instability of a high-frequency discharge plasma in a constant magnetic field arising from the action of the average force on a charged particle tending to cause it to move away from regions of high alternating field intensity is discussed. The average force on the charged particle in an inhomogeneous alternating field is derived from the equation of motion of the particle under the influence of the Lorentz force and the damping force due to collisions with neutral atoms, by representing the position vector of the particle as a sum of slow-varying and fast-varying parts and appropriately averaging over the latter. That force is included, together with the diffusion terms and the forces due to charge separation, in the continuity equations for the electron and ion components of the plasma. Linearized equations for small pertubations are derived, and from them there are obtained stability conditions. It is shown that the plasma is stable (with respect to the perturbations under consideration) in the absence of a constant external magnetic field provided the Langmuir frequency is high compared with both the collision frequency and the frequency of the alternating field, but that instability can arise in the presence of a magnetic field if both the Langmuir and the Larmor frequencies are high and the collision frequency is low compared with the frequency of the alternating field. (ATD)

46903 INVESTIGATION OF ELECTRON-CYCLOTRON HEATING OF PLASMA. Golant, V. E.; D'yachenko, V. V.; Novik, K. M.; Podushnikova, K. A. (Ioffe Inst. of Physics and Tech., Leningrad). Zh. Tekh. Fiz., 36: 1027-33(June 1966). (In Russian).

Experiments on heating plasmas in a magnetic mirror system by supplying energy at the electron cyclotron resonance are described which differed from other such experiments in that separate oscillators were employed to produce the plasmas and to heat them. The plasmas were produced in 9 cm diameter, 18.5 or 30 cm long copper resonators containing hydrogen at from 5×10^{-6} to 10^{-3} mm Hg. The shorter resonator communicated via a 3.5 cm diameter hole in an end wall with a glass tube. The resonator in use was mounted between magnetic mirrors (mirror ratio, 1.8) 30 cm apart. When the shorter resonator was employed, the glass tube was in the region of one of the magnetic mirrors; in all cases the copper resonator was between the mirrors. Approximately 100 w of rf power at 9.3-9.5 kMHz was continuously supplied to the resonator to ionize the gas and 4.12 to 30 μsec pulses of rf power at the same frequency with pulse powers up to 100 kw were

employed to heat the plasma. The visible radiation from the plasma was recorded with a photomultiplier, the x radiation from the plasma was recorded with a 0.1 × 3 or a 3 × 3 cm NaI scintillator shielded with 1 cm of lead, and the plasma was probed with 10, 3.3-4, and 0.8 cm wavelength microwave beams. The continuous 100 w excitation at 9.3-9.5 kMHz produced plasmas with electron densities of the order of 10^{12} cm^{-3} when both magnetic mirrors were operating, and part of the plasma produced in the shorter copper resonator appeared in the portion of the glass side tube that was between the magnetic mirrors. The uhf pulses were strongly absorbed by the plasma; under favorable conditions 30% of the pulse power was absorbed. The maximum energy thus injected into the plasma was 0.2 J. X radiation was observed when the plasma was excited by the powerful uhf pulses. From the absorption curve of the x radiation it was concluded that electrons with energies up to 100 kev were present with a concentration (estimated from the total absorbed energy and the volume of the plasma) of the order of 10^{10} cm^{-3}. The x-ray pulse was delayed by some 4-5 microsec with respect to the exciting uhf pulse, and when the uhf pulse duration was less than 5 microsec the x rays did not appear. In view of the fact that plasmas produced during the experiments within the shorter metallic resonator appeared outside the resonator in the glass tube, it is suggested that it may be possible simultaneously to heat both the ions and the electrons of the same plasma within a single magnetic mirror system by suppling energy at both the electron and the ion cyclotron frequencies. (ATD)

46904 METHOD FOR DETERMINING REFLECTION COEFFICIENTS IN PLASMA WAVEGUIDES. Ivanov, B. I. Zh. Tekh. Fiz., 36: 1034-9(June 1966). (In Russian).

A technique is proposed for measuring the reflection coefficient at a nonuniformity in a plasma waveguide when it is not possible to measure the standing wave ratio, as, for example, when the wavelength is comparable with the length of the waveguide. The idea of the method is to vary locally at an appropriate frequency some characteristic of the plasma waveguide so as to modulate waves transversing the region of variation and to measure the relative modulation of the waves in different parts of the waveguide. If there is present only a unidirectional traveling wave (no reflections), modulation of the wave will be detected only in the portion of the waveguide beyond the modulating region; if, on the other hand, reflection occurs somewhere beyond the modulating region, a backward-traveling wave will be present and modulation will be detected on both sides of the modulating region. Formulas are derived for calculating the reflection coefficients at the two ends of a waveguide excited at its center from percentage modulation measurements in different parts of the waveguide when the modulating region is located first on one side of the exciting antenna and then on the other. The method was tested by measurements on a 1-cm-diameter 150-cm-long plasma waveguide in a 3-cm-diameter quartz tube, excited at 1 MHz with the aid of a short helix wound on the tube near its center. One end of the waveguide was open and the other end was equipped with an external conical water cell to provide loading and reduce the reflection. Modulation was effected by exciting with alternating current (50 Hz) a 12 cm long section of the solenoid that provided the longitudinal magnetic field. The alternating current in the modulating section of the solenoid was an order of magnitude lower than the direct current in the rest of it. A signal was picked up from the waveguide by a movable stub antenna and the modulation percentage was measured by conventional means with the aid of a heterodyne receiver. The measured reflection coefficients at the two ends of the waveguide were 1 and 0.1; they were independent of the strength of the alternating current in the modulating section, provided it was kept sufficiently small, and of the amplitude of the waves in the waveguide. (ATD)

46905 COAXIAL PLASMA GUN IN A LONGITUDINAL MAGNETIC FIELD. Zolototrubov, I. M.; Kiselev, V. A.; Novikov, Yu. M.; Ryzhov, N. M.; Tolok, V. T. Zh. Tekh. Fiz., 36: 1040-8(June 1966). (In Russian).

In an effort to improve the purity and the uniformity with regard to velocity, density, and total number of particles of the plasma bursts from a coaxial plasma gun, the influence of a longitudinal magnetic field on the performance of the gun was investigated. It was anticipated that the rotation of the plasma within the gun, due to the Lorentz force on the radial current in the longitudinal magnetic field, would improve the azimuthal uniformity of the current sheet. The diameters of the inner and outer stainless steel electrodes of the 70 cm long coaxial gun were 3 and 7 cm, respectively. The gas (0.1 cm^3 of hydrogen) was admitted through six openings in the inner electrode near its center, and the gun was fired by the 20 kv discharge of a 12 microfarad capacitor. The plasma gun was located in the uniform portion of the field of a 1.4 m long solenoid. The magnetic field rose to its maximum strength of up to 8 kOe in 28 millisec and subsequently decayed exponentially with a time constant of 72 millisec. The processes taking place within the plasma gun were investigated with the aid of a magnetic probe and by recording the discharge current, and the plasmas ejected from the gun were investigated with an external magnetic probe, a spectrograph, a photomultiplier, a monochrometer with the aid of which the intensities of different spectrum lines were displayed on an oscillograph, and a thermal probe. The rather involved processes that took place within the gun are discussed at some length. The rotation of the plasma gave rise to a magnetic trap within which a considerable portion of the gas was confined. Two plasma bursts were usually produced, but under some conditions it was possible to obtain only one burst containing some 2×10^{16} particles at a density of 2.4×10^{13} cm^{-3} and moving with a velocity of 3×10^7 cm/sec. The purity of the plasma bursts increased with increasing longitudinal magnetic field strength; at a magnetic field strength of 6.4 kOe there were no lines due to electrode materials in the spectrum, and the lines due to carbon, oxygen, and nitrogen were considerably weaker than in the spectra of plasmas produced without the magnetic field. It is concluded that with the aid of a longitudinal magnetic field one can obtain from a coaxial plasma gun pure high-energy plasmas free of slow and contaminated tails, but at the cost of inefficient use of the energy stored in the capacitor bank. (ATD)

46906 STRUCTURE OF THE PLASMAS EMITTED BY A COAXIAL PLASMA GUN WITH DIFFERENT ELECTRODE POLARITIES. Zolototrubov, I. M.; Skoblik, I. P.; Skibenko, A. I.; Ryzhov, N. M. Zh. Tekh. Fiz., 36: 1049-54(June 1966). (In Russian).

The influence of electrode polarity and duration of the delay between gas injection and discharge of the gun on the structure of the plasmas ejected during the first half-period (6.5 microsec) of operation of a 60-cm-long coaxial plasma gun with electrode diameters of 3 and 6.5 cm were investigated. The gas was admitted during the course of 80 μsec through a single opening in the center of the outer electrode, and the gun was fired after a delay ranging from 100 to 260 μsec by the discharge of a 20-kv, 12-microfarad capacitor. The plasmas were investigated in a 10 cm diameter, 1.2 m long glass drift tube with the aid of two diamagnetic probes, an 8 mm wavelength microwave interferometer, a 4 mm wavelength microwave beam, and a thermal probe. Under all conditions there was observed a jet of unionized gas with a velocity of 2×10^6 cm/sec. When the inner electrode of the plasma gun was positive there were ejected three plasma bursts with velocities (when the delay time was 100 μsec) of 5×10^7, 1.5×10^7, and 5×10^6 cm/sec and particle densities of less than 10^{12}, 6×10^{12}, and 7×10^{13} cm^{-3}, respectively. When the inner electrode was negative there were only two plasma bursts, with velocities and particle densities (again for a delay time of 100 μsec) of 3.5×10^7 and 8.7×10^6 cm/sec, and 3.5×10^{12} and 7×10^{13} cm^{-3}, respectively. The velocity of the slowest burst was almost independent both of delay time and of electrode polarity, and its density, also independent of electrode polarity, increased with increasing delay time. The velocities and densities of the faster bursts decreased with increasing delay time. (ATD)

46907 DENSITY DISTRIBUTION OF HYDROGEN IN A COAXIAL PLASMA GUN BEFORE APPLICATION OF HIGH VOLTAGE TO THE ELECTRODES. Chicherov, V. M. Zh. Tekh. Fiz., 36: 1055-7(June 1966). (In Russian).

The density distribution of hydrogen within a coaxial plasma gun was measured at different times following admission of the gas, with the aid of beams of 4- to 10-kev H^+ and He^+ ions. The measurements were undertaken in the hope of improving understanding of the dependence of the properties of plasma bursts from coaxial plasma guns on the delay time between admission of the gas and application of the potential. The diameters of the plasma gun electrodes were 3 and 7.5 cm. Approximately 0.2 cm^3 of hydrogen was admitted to the evacuated plasma gun for each measurement and the density of the hydrogen was determined at a selected position along the gun for the attenuation of the ion beam was due mainly to charge exchange collisions. From 125 to 150 μsec after the gas valve was opened the mean hydrogen density within a centimeter or two of the point of admission was a few times 10^{15} atom/cm^3. Thereafter the gas expanded along the gun with thermal velocities and streamed out the end of the gun (4 cm from the point of gas admission), forming a gas cushion with an effective thickness of the order of 10^{16} atom/cm^2. The number of high-energy protons in the plasma burst can be drastically reduced by charge exchange collisions while the plasma traverses this cushion of neutral hydrogen. (ATD)

46908 MINIMUM ENERGY REQUIRED FOR INITIATION OF AN ELECTRICAL BREAKDOWN IN VACUUM. Slivkov, I. N. Zh. Tekh. Fiz., 36: 1084-6(June 1966). (In Russian).

Spark-initiated breakdowns in vacuum (approximately 4×10^{-6} mm Hg) between 4 to 5 cm diameter hemispherical electrodes of aluminum, copper, lead, and stainless steel was investigated. The potential (up to 120 kv) was applied in pulses of 60 μsec duration. The trigger electrode was mounted almost flush with the surface of the cathode and was excited with 0.1 to 1 kv pulses of 3 μsec duration. The occurrence of a trigger spark was verified with the aid of a photomultiplier. It was found that vacuum discharges to an aluminum cathode could be triggered (but with low probability) by a spark of which the energy was only 10^{-8} J. The minimum trigger energies for the other cathode materials were somewhat higher, the highest being 6×10^{-7} J for stainless steel. The anode material did not affect the minimum trigger energy. No breakdown occurred when the main voltage pulse was applied after the trigger pulse, even when the delay was only 0.1 μsec and the trigger energy was increased by a factor of 1000. When the trigger electrode was mounted 2 to 3 mm behind a metallic screen covering an 8-mm-diameter hole in the surface of the cathode the minimum trigger energy increased by more than four orders of magnitude. A similar increase in the minimum trigger energy occurred when the trigger electrode was mounted flush with the anode surface, and the minimum trigger energy increased rapidly with increase of the gap length from 4 to 20 mm. When the breakdown was triggered at the anode there was a 0.5 μsec delay between application of the trigger pulse and the sudden occurrence of the breakdown; when the breakdown was triggered by a low-energy spark at the cathode, the delay was shorter but the gap potential fell more slowly. It was concluded that vacuum gaps are very sensitive to processes taking place on their cathodes, and it is suggested that the breakdown of a vacuum gap is determined less by the total number of charged particles or the quantity of gas entering the gap than by the presence near the cathode and within the field of the electrodes of a small quantity of dense plasma. (ATD)

46909 SPECTROSCOPIC INVESTIGATION OF THE INTERACTION OF PLASMA WITH CHARGED PARTICLE BEAMS. Lifshits, E. V.; Berezin, A. K.; Lyapkalo, Yu. M. Zh. Tekh. Fiz., 36: 1087-93(June 1966). (In Russian).

A spectroscopic study was made of processes taking place in the interaction of beams with plasma in order to establish quantitatively the main parameters of the process and their interdependencies. Electron temperature, ion temperature, and high-frequency field strength were determined experimentally. In the electron-temperature measurements, a 12-amp, 20-kev electron beam was passed through a discharge tube at pressures from 8×10^{-4} to 10^{-2} mm Hg. Pulse duration was 4.5 μsec, frequency 50 pulses per sec, and beam diameter 20 mm. Plasma density with passage of the beam reached 6×10^{11} per cm^3. The process took place in a constant magnetic field of 0.12 emu. The discharge tube was filled successively with argon, helium, hydrogen, and air. High-frequency oscillations generated by passing an electron beam through a plasma were measured within the 600 to 2000 and 2400 to 7500 Mc ranges. Oscillations within these ranges occurred at pressures of 5×10^{-3} and lower, the averaged electron temperatures being 88, 65, and 66 ev at 5×10^{-3}, 4×10^{-3}, and 3×10^{-3} mm Hg, respectively. The electron temperatures at higher pressures (1×10^{-2} mm Hg), where no oscillations occurred, were 2 to 3.5 times lower. Measurements of the radiation intensity were conducted to determine the character of its relation to the current pulse. The shape of the luminosity curve suggested that it is a result of high-frequency plasma oscillations and, to a greater degree, of the collisionless heating of plasma electrons. The ion-temperature measurements were based on profiles of the spectral lines of ions and atoms. A table summarizes the results from ion-temperature measurements for oxygen, helium, hydrogen, and air and hydrogen. At higher pressures, high-frequency oscillations did not occur, while ion temperatures were about half the values given in the table. The temperature rise apparently is caused by both collisions and the effect of a constant electric field. A profile widening observed in the case of hydrogen atoms is attributed to the high-frequency Stark effect. (ATD)

46910 ANISOTROPY OF A LOW-TEMPERATURE PLASMA AND OPTIMAL MAGNETOHYDRODYNAMIC CONVERTERS. Pleshanov, A. S. (Krzhizhanovskii Inst. of Power Engineering, Moscow). Zh. Tekh. Fiz., 36: 1094-9(June 1966). (In Russian).

Ion slippage is taken into account in a treatment of the mechanics and thermodynamics of the flow of a weakly ionized plasma in a magnetic field. It is shown that as a result of ion slippage the tangent of the angle between the transverse components of the current and the effective electric field is not a monotonic function of the magnetic field strength and that Tonks' theorem does not hold. A stationary process in crossed fields is discussed in more detail in the "quasi-one-dimensional" approximation with the induced magnetic field neglected. A variational method is employed to show that of the three basic types of linear magnetohydrodynamic converters based on plasma anisotropy, that one is optimal, in the sense that it has the least volume for a given power, in which the electrodes are so sectioned that the axial current (the Hall current) vanishes. In the case of a Hall converter, the specific power is not a monotonic function of the magnetic induction, but passes through a maximum and approaches zero as the induction increases without limit. Numerical calculations were performed for a helium-cesium plasma, and the results are tabulated. It was found that at a temperature of 2000°K and a pressure of 0.1 atmosphere the anisotropy of the helium-cesium plasma is maximum for a magnetic induction of 2×10^4 gauss. Thus, in a closed cycle magnetohydrodynamic converter the effect of ion slippage is predominant when the ratio B/p of the magnetic induction to the pressure is close to 2×10^5 gauss/atmosphere and is negligible when B/p is as low as 2×10^4 gauss/atmosphere. (ATD)

46911 STABILIZATION OF HYDRODYNAMIC DRIFT OSCILLATIONS IN A NONUNIFORM ROTATING CYLINDRICAL PLASMA. Baikov, I. S. (Lebedev Inst. of Physics, Moscow). Zh. Tekh. Fiz., 36: 1137-40(June 1966). (In Russian).

Stabilization by a nonuniform radial electric field of the

long wavelength hydrodynamic oscillations of a nonuniform plasma cylinder in a longitudinal magnetic field is considered. It is assumed that the strength of the radial electric field is proportional to the distance r from the axis, that the ion density is a Gaussian function of r, and that the magnetic pressure is much higher than the kinetic pressure. The linearized equation for potential oscillations, based on the kinetic equation and the self-consistent Maxwell field, is written for oscillations of frequency f such that $|f - Lu|$ is small compared with the ion Larmor frequency and large compared with the product of the longitudinal wave number by the electron thermal velocity. Here L is the azimuthal wave number and u is the frequency of the drift rotation of the plasma cylinder in the crossed fields. From that equation there are derived expressions for the complex frequencies of the oscillations. The radial electric field tends to stabilize all the long wavelength oscillations with frequencies lower than the Larmor and drift frequencies of the particles. (ATD)

46912 PROPERTIES OF A HIGH-VOLTAGE HOLLOW ANODE GLOW DISCHARGE. Udris, Ya. Ya.; Guseva, L. G.; Chernov, V. A. (All-Union Lenin Electrotechnical Inst., Moscow). Zh. Tekh. Fiz., 36: 1140-3(June 1966). (In Russian).

High voltage (3 to 25 kV) glow discharges were investigated in air and different inert gases at pressures from 0.001 to 0.1 mm Hg and currents from 0.0001 to 1 A between 6 to 35 cm diameter plane cathodes and plane or hollow anodes of the same diameter (the hollow anodes were from 15 to 100 cm deep). The current distribution on the plane end of a hollow anode was the same as on a plane anode, thus confirming the conclusion of G. W. McClure (Phys. Rev. 124: 696, 1961) that the glass tube confirming the discharge in the case of plane electrodes becomes charged to approximately the anode potential and so gives rise to conditions approximating those within a hollow anode. The discharge current was found to be focused onto the central portion of the plane end of the hollow anode. The current to the cathode surface on the other hand, was not concentrated in the central region of the electrode, the current density was actually somewhat lower in the center of the cathode than at some distance from the center. The focusing of the current on the anode and its defocusing on the cathode were enhanced by a longitudinal magnetic field. The enhancement of the current focusing due to the field of a short solenoid depended strongly on the axial position of the solenoid. Particles were withdrawn from the discharge region through holes in the electrodes. Difficulty was experienced with discharges through the openings in the electrodes when the pressure in the regions beyond the electrodes was the same as in the interelectrode region, but such discharges could be avoided by maintaining a low pressure in the regions beyond the electrodes. From measurements of the particles withdrawn from the discharge region through holes in the electrodes it was concluded that 75–80% of the energy of the hollow anode discharge is carried by the electron current to the anode. (ATD)

46913 PROPERTIES OF AN ULTRAHIGH-FREQUENCY DISCHARGE IN A MAGNETIC FIELD. Golant, V. E.; Krivosheev, M. V.; Yachnev, I. L. (Kalinin Polytechnic Inst., Leningrad). Zh. Tekh. Fiz., 36: 1144-6 (June 1966). (In Russian).

Plasmas produced by high-frequency discharges in argon at 0.001 to 1 mm Hg in the presence of an up to 1.9 kOe magnetic field were investigated. The gas was contained in a 1 cm diameter, 80 cm long quartz tube mounted on the axis of a 7 cm diameter waveguide of circular cross section, excited in the TE_{11} mode at 3.15 kMHz. The waveguide was so terminated that the standing wave ratio did not exceed 1.3. Approximately 16 cm of the length of the quartz tube was within the high field portion of the waveguide, and the magnetic field strength did not vary by more than 1% over that portion of the tube. The plasmas produced in the quartz tube were investigated with a double probe and by means of loading by the plasmas of a resonant cavity operating in the 3-cm-wavelength region. Visible radiation from the plasmas was recorded with a photomultiplier. The r-f electric field strength required to initiate a discharge was minimum when the magnetic field strength was such that the electron Larmor frequency was equal to the exciting frequency. The charged particle density of the plasma (as measured with the resonant cavity), the probe current, and the intensity of the visible radiation from the plasma, however, were maximum when the Larmor frequency was one-half or one-third of the exciting frequency, and the corresponding curves showed no maxima or other features when the Larmor frequency was equal to the exciting frequency. Plasmas with charged particle densities exceeding 10^{12} cm^{-3} were obtained in argon at 0.01-mm Hg in a 500-Oe magnetic field with an r-f power of 10 W/cm^3. It is suggested that the maxima at the second and third harmonics of the Larmor frequency may be due to nonlinear effects or to space dispersion, and that the low plasma density at the Larmor frequency may be due to reduced penetration of the high frequency field into the plasma. (ATD)

46914 MECHANISM FOR STABILIZATION OF BEAM INSTABILITY. Shapiro, V. D.; Shevchenko, V. I. Zh. Tekh. Fiz., 36: 1151-4(June 1966). (In Russian).

The stability of a plasma filament in a strong magnetic field in the presence of a low density axial electron beam whose diameter is equal to that of the plasma filament is discussed. The relevant dispersion equation is written, its roots are discussed, and the condition is derived for the stability of the plasma against low-frequency oscillations. It is noted that when the stability condition is nearly but not quite satisfied (the case of "low supercriticality") there arises a nonuniform distribution of the energy density of electrostatic oscillations, which produces an additional force on the electrons that can tend to stabilize the plasma. The effect of the electrostatic oscillation energy density distribution nonuniformity on the plasma stability is discussed quantitatively and the conditions are found under which it can tend to stabilize the plasma. (ATD)

46915 EVALUATION OF ELECTRON TEMPERATURE FROM POWER DISSIPATION MEASUREMENTS IN A HIGH CURRENT ARC. Duncan, S. L.; Jobes, F. C.; Hickok, R. L. (Socony Mobil Oil Co. Inc., Princeton, N. J.). 14p. (CONF-651126-23). ORAU. Gmelin, AED-CONF-65-353-58.

From American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco.

Gibbons has proposed an idealized model of a magnetically confined arc discharge that provides an evaluation of the average electron temperature and the plasma space potential from the power balance equation; provided the density, ion temperature, and ion current are known. Furthermore he has shown that the results can be used to calculate the power delivered to the arc anode. This model was applied to an energetic deuterium arc using the density measurements described earlier. The arc was operated with gas feeds of 3.5 and 4.2 atm-cc/sec and over the current range of 100 to 300 amperes. The power calculations will be compared with the anode power dissipation determined from the temperature rise of the cooling water and the average electron temperature with optically determined electron temperatures weighted according to the radial density distribution. (auth)

46916 RADIAL DISTRIBUTION OF OPTICAL INTENSITY AND DEUTERIUM DENSITY IN A HIGH CURRENT ARC PLASMA. Jobes, F. C.; Marshall, J. F.; Hickok, R. L. (Socony Mobil Oil Co. Inc., Princeton, N. J.). 16p. (CONF-651126-24). ORAU. Gmelin, AED-CONF-65-353-59.

From American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco.

The radial deuterium density distribution in a magnetically confined, high-current, deuterium arc was determined by probing the plasma with a 1.8-Mev deuteron beam and measuring the proton production rate from the $D(d,p)H^3$ reaction. A small quantity of He was added to the gas feed and the intensity distributions of the D-β and He ion and neutral lines were also observed. Electron tem-

peratures were determined from the intensity ratio of the helium singlet and triplet lines. If it is assumed that the D-β excitation is produced only by electron collision then it is possible to calculate the shape of the D-β distribution from the measured deuterium density distribution and the electron temperature. For high arc currents, where there is almost complete ionization and utilization of the input gas feed, the agreement between the calculated and observed distribution is quite good. For low arc currents the He spectroscopic data indicates strong peaking in the electron temperature distribution that is not reflected in the D-β intensity. The decreased deuterium density for the lower arc currents may lead to electron streaming and invalidate the temperature evaluation. (auth)

46917 COMPLEX MODES IN LOSSLESS, LONGITUDINALLY MAGNETIZED PLASMA GUIDES. Likuski, R. K. (Univ. of Texas, Austin). 11p. (CONF-651126–25). ORAU. Gmelin, AED-CONF-65-353-60.

From American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco.

The existence of modes with complex propagation constants were predicted by Chorney in lossless waveguides loaded with gyrotropic material. Circular symmetric modes of this type were found by solving the dispersion equation for a circular cylindrical guide filled with a lossless, longitudinally magnetized plasma. The complex propagation constants originate from a purely propagating mode where the group velocity is zero and eventually become purely cutoff modes. The electric fields, magnetic fields and Poynting vector were evaluated across the guide for these modes. The z-component of the Poynting vector changes direction over the cross section of the guide so that no net power is carried down the guide by the complex mode. (auth)

46918 HIGH-POWER MICROWAVE EMISSION FROM A PLASMA DISCHARGE. Waniek, R. W.; Grannan, R. T.; Swanson, D. G. (Advanced Kinetics, Inc., Costa Mesa, Calif.). 16p. (CONF-651126–26). ORAU. Gmelin, AED-CONF-65-353-52.

From American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco.

The observation is reported of unprecedented amounts of microwave emission from a nonequilibrium plasma due to collective effects. The measurements were made upon a modified PIG discharge located in a mirror field. Strongly field-dependent emission as high as 500 watts at x band (TE_{10} cut-off frequency 6.56 GHz) and 30 watts at K band (TE_{10} cut-off frequency 14.08 GHz) was observed at a time when the plasma frequency is in the vicinity of the electron cyclotron frequency. The data indicate that the emission is partially coherent, with polarization E || B and E ⊥ B excited in approximately equal amounts. At the time the pulse is emitted, x rays due to 200-kev electrons have been detected. (auth)

46919 HOT PLASMA IN A CYLINDRICAL WAVEGUIDE. Swanson, D. G. (Univ. of Texas, Austin). 34p. (CONF-660633–9). ORAU. Gmelin, AED-CONF-66-199-8.

From American Physical Society, Division of Plasma Physics, Minneapolis, Minn.

An approximate theory for the propagation of waves in a hot plasma in a cylindrical waveguide with a static axial magnetic field is presented. The basic approximation is that the zero order distribution function is unaffected by the boundary which should be appropriate if the waveguide radius is much greater than the Larmor radius. In this case, the infinite plasma equivalent dielectric tensor may be used, and transformed into cylindrical coordinates. Maxwell's equations are solved algebraically with the resulting tensor and the final equations may be interpreted unambiguously in terms of the transverse portion of the Laplacian operator. The algebraic expressions are then converted into coupled second order differential equations which are solved to obtain the dispersion relation. The boundary value problem is solved for cylindrically symmetric modes. The results are valid for zero and first order in the Larmor radius terms, and if the finite Larmor radius terms are dropped, the results are formally identical to the cold plasma equations. Mode orthogonality and some limiting cases are discussed. (auth)

46920 GENERATING A HOT-ION, MAGNETICALLY CONFINED PLASMA WITH A MODIFIED PENNING DISCHARGE. Roth, J. Reece (National Aeronautics and Space Administration, Cleveland). 4p. (CONF-660633–7). ORAU. Gmelin, AED-CONF-66-199-7.

From American Physical Society, Division of Plasma Physics, Minneapolis, Minn.

A modified Penning discharge apparatus is described for producing plasmas. The novel features of this discharge include: injection of the operating gas through holes in the anode ring, which allows the discharge to operate in the high-power mode at much lower neutral background gas pressures than is customary with the conventional Penning discharge; operation in strong magnetic fields, up to 20 kG; and placement of the anode ring at the midplane of a magnetic bottle geometry, which makes possible ion trapping and higher ion densities in the magnetic bottle than is possible with the uniform magnetic field conventionally used. (M.O.W.)

46921 SOME ATTEMPTS TO PRODUCE QUIESCENT PLASMAS. Husimi, K. (Nagoya Univ., Japan). 12p. (CONF-651126–19). ORAU. Gmelin, AED-CONF-65-353-64.

From American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco.

Three discharge tubes are described for producing quiescent plasmas. Noise analyses were made for each. (M.O.W.)

46922 HIGHLY IONIZED PLASMAS IN HOT-CATHODE PIG DISCHARGES. Chorney, P.; Madore, R. J. (Microwave Associates, Inc., Burlington, Mass.). 15p. (CONF-651126–22). ORAU. Gmelin, AED-CONF-65-353-48.

From American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco.

Extensive studies were made of hot-cathode PIG discharges for the purpose of efficiently generating densities in the range of 10^{12} to 10^{15} cm^{-3}. The discharge configurations consisted of a pair of impregnated cathodes facing each other with an anode structure located between them. Typical dimensions were .250-in. cathode diameter and 1.5-in. spacing between cathodes. Continuous discharges were run in xenon at pressures of approximately 3×10^{-2} torr. Densities as high as 3×10^{14} cm^{-3} were measured with Langmuir probes. For these densities the approximate conditions were a 4 amp discharge current, an 18 v anode-cathode drop, and a magnetic field of 2000 gauss. Good agreement between Langmuir probe diagnostics and microwave scattering in the 70-Gc range was obtained for densities about 5×10^{13} cm^{-3}. Axial and radial density profiles were measured with a moveable probe. These were in agreement with profiles predicted by an analysis based on magneto-ambipolar diffusion. (auth)

46923 HIGH POWER BEAM-PLASMA INTERACTION EXPERIMENTS. Biechler, C. S.; Allen, M. A.; Chorney, P. (Microwave Associates, Burlington, Mass.). 11p. (CONF-651126–20). ORAU. Gmelin, AED-CONF-65-353-47.

From American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco.

A controlled beam-plasma interaction was used to coherently amplify microwave signals. A 0.5-in. diameter electron beam at 20 kv and 2.8 amperes was passed through a highly ionized plasma and thirty-five percent of the beam power was converted to r-f power, 22 kw being obtained at 3000 Mc. To focus the beam and inhibit radial diffusion of the plasma, a magnetic field of about 500 gauss was used. The magnitude of the observed gain, 58 db with small signal and 35 db at maximum power, indicate that the plasma frequency was close to the signal frequency. Several methods of plasma generation were investigated, however, perturbation in the plasma caused by the large r-f fields on the beam imposed a lower usable

limit of 10% on the ionization. Of the methods investigated the only one successful in achieving the required density and ionization percentage was the use of ionizing collisions between gas atoms and beam electrons. The adjustment of pressure and the application of electrostatic potential wells were required. The gas used was xenon with the pressure approximately 3×10^{-5} torr. (auth)

46924 KINETIC EQUATIONS FOR ELECTRON-PHOTON GAS IN AN EXTERNAL MAGNETIC FIELD. Chappell, Willard R. (Harvard Univ., Cambridge, Mass.). 46p. (CONF-651126-21). ORAU. Gmelin, AED-CONF-65-353-54.

From American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco.

Kinetic equations are derived for an electron-photon gas in a constant, external field. The formalism of second quantization is used. The orbital motion of the electrons is included by the use of the Landau representation. A hierarchy of equations is developed. The Bogoliubov approach is used to truncate the hierarchy and obtain irreversible equations. The resulting kinetic equations include the effects of cyclotron radiation and electron-photon scattering, and effects due to the dynamic screening of the electrons. (auth)

46925 INTERACTION OF A PLASMA FLOW WITH A THREE-DIMENSIONAL MAGNETIC DIPOLE. Waniek, Ralph W.; Kasai, George H. (Advanced Kinetics, Inc., Costa Mesa, Calif.). 20p. (CONF-651126-27). ORAU. Gmelin, AED-CONF-65-353-53.

From American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco.

The Chapman-Ferraro problem was investigated experimentally with appropriately scaled parameters by impinging a high speed hydrogen plasma stream against a three dimensional magnetic dipole. The flow is controllable in velocity between 10^6 and 10^7 cm/sec and in density between 10^{12} and 10^{14} particles/cm^3 with particular emphasis placed on planarity and on radial uniformity in density. A strong-field multiturn coil is transiently energized and the plasma flow is timed to impact at peak field, which generates a well defined cavity of about 15 cm stand-off distance. The general boundary shape in the frontal hemisphere was studied as a function of attitude angle by means of a number of diagnostic techniques, thus allowing comparison with the theoretical models of the terrestrial magnetosphere. (auth)

46926 METHOD FOR THE AFTER-ACCELERATION AND/OR REFLECTION OF PLASMOIDS IN AN ELECTRODELESS PLASMA ACCELERATOR. Michel, Alfred; Schindler, Heinrich (to Siemens-Schuckertwerke Aktiengesellschaft). German Patent 1,220,530. July 7, 1966. Filed Oct. 24, 1964.

The method for the after-acceleration and/or reflection of plasmoids by means of a device comprising a plurality of Helmholtz coils arranged on a common axis through which current is passed in opposite directions to generate three-dimensional bicuspid field geometries, and auxiliary coils between the main cusp coils according to Patent 1,209,670 comprises the steps of stopping the translational motion of the plasmoid in each of the cusp fields for a few micro-seconds thereby raising the thermal energy of the plasma, and of passing a very fast current pulse of desired direction through the respective auxiliary coil afterwards. (Gmel. Inst.)

Shielding

Refer also to abstract 46317.

46927 (JINR-P-2846) FLYUKTUATSII V LIVNYAKH, OBRAZOVANNYKH ELEKTRONAMI S ENERGIEI OT 45 DO 330 Mev. (Fluctuations in Showers Produced by 45–330 Mev Electrons). Zaimidoroga, O. A.; Prokoshkin, Yu. D.; Tsupko-Sitnikov, V. M. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems). 1966. 23p. Dep. mn.

The fluctuations in the electron-proton showers in lead, generated by primary 45-, 130-, 230-, and 330-Mev electrons, were studied with a multi-plate cloud chamber. The dependence of the energy loss on the absorber thickness was found for the energy 330 Mev. The half-width of the loss curve changes from 65% for $t = 10.2$ g/cm^2 to 30% for $t = 49.8$ g/cm^2 and is proportional to $E_0^{-1/4}$. The values of probabilities are obtained for change of the electron number in showers at different absorber thicknesses. It is shown that the changes of the electron number for all energies and absorber thicknesses are satisfactorily described by the Poisson distribution for showers with an even and odd electron number separately. The correlations of the electron number fluctuations are analyzed at different absorber thicknesses. It is shown that the fluctuations strongly damp, passing through a 6–8 g/cm^2 lead layer, irrespective of a primary electron energy and an absorber depth. All the shower characteristics are obtained for the cutoff spectrum energy of secondary electrons of about 1 Mev. (auth)

46928 (ORNL-3973(Vol.1), pp 26-47) REACTOR AND WEAPONS SHIELDING. (Oak Ridge National Lab., Tenn.).

Thermal-neutron fluxes reflected from concrete were measured as a function of angles of incidence and reflection for incident epicadmium neutrons. Calculations of the differential angular albedo of subcadmium neutrons arising from incident monodirectional beams of epicadmium neutrons on concrete were made and were compared with experiment. Measurements were made of the thermal-neutron flux and fast-neutron dose rate down rectangular concrete ducts with one and two bends. Calculations were made of thermal-neutron fluxes and fast-neutron dose distributions in one-, two-, and three-legged rectangular concrete ducts, and were compared with experiment. Experiments were made to measure the fast-neutron dose rate transmitted through a LiH shield with an iron-oil collar shield, designed for use with SNAP power plants. To aid in the design of a specific collimator for the SNAP core-mapping experiments, a series of Monte Carlo calculations using the 05R code were made to determine the effect of the collimator geometry on the ratio of neutrons that arrive directly at the detector to neutrons that are scattered or transmitted by the walls of the collimator shield. The transport of neutrons from point isotropic fission and 14-Mev sources in an infinite air medium was calculated by the Monte Carlo 05R code and by the ANISN discrete-ordinate code. Progress in discrete-ordinate transport theory and applications to shielding problems are reported. (S.F.L.)

46929 (ORNL-3973(Vol.1), pp 48-51) RADIATION SHIELDING INFORMATION CENTER. (Oak Ridge National Lab., Tenn.).

A brief review is given of the programs being carried out by the Radiation Shielding Information Center (RSIC). These programs include literature reviews on reactor and weapons shielding, space and accelerator shielding, and computer codes for shielding calculations. (S.F.L.)

46930 (ORNL-3973(Vol.1), pp 52-9) MATHEMATICS AND COMPUTER PROGRAMS. (Oak Ridge National Lab., Tenn.).

Brief summaries are given of some work in mathematics and computer programs. These include shielding design calculations for fuel-handling facilities; computer calculations of γ-ray transport and dose rates; Monte Carlo calculations; the 05R program for neutron transport; random number generators for the IBM 360; CDC 160-A programs for processing data from neutron time-of-flight cross-section measurements; a program to calculate Legendre coefficients from angular distributions; and impossible Legendre coefficients. (S.F.L.)

46931 (ORNL-3973(Vol.2)) NEUTRON PHYSICS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING MAY 31, 1966. (Oak Ridge National Lab., Tenn.). Sept. 1966. Contract W-7405-eng-26. 36p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Separate abstracts were prepared for the three sections of the report. (S.F.L.)

For abstracts of individual sections see: 46049, 46932, and and 46933.

46932 (ORNL–3973(Vol.2), pp 71-84) THEORETICAL STUDIES FOR HIGH-ENERGY RADIATION SHIELDING. (Oak Ridge National Lab., Tenn.).

A series of Monte Carlo calculations were made of the radiation hazard due to exposure of supersonic jet aircraft to solar flares. Results are given for altitudes up to 85,000 ft. Monte Carlo calculations were made of the transport of very high energy muons through thick shields. The proton spectrum is given for nuclear collisions of 1.7-Bev/c mesons (π^-) in emulsions. Preliminary calculations of nucleon-nucleus reactions at ~700 Mev have been made and compared with experiment. Analytic representations are given of inelastic cross sections and particle-emission spectra for nucleon-nucleus collisions in the energy range 25 to 400 Mev using an intranuclear cascade model. Results are presented for 400-Mev protons incident on aluminum. (S.F.L.)

46933 (ORNL–3973(Vol.2), pp 85-95) EXPERIMENTAL STUDIES FOR HIGH-ENERGY RADIATION SHIELDING. (Oak Ridge National Lab., Tenn.).

Experimental equipment is described which is to be used for measuring neutron energy spectra between 2 and 50 Mev from targets bombarded by 600-Mev protons. A computer code was developed to analyze the data from these experiments, and some of the final results are presented for aluminum and bismuth targets. An analysis was made of secondary gamma-ray data obtained with 16-, 33-, and 56-Mev protons and 58-Mev alpha particles on targets ranging from ^{7}Li to Fe. An evaluation was made of interest in and uses for the IBM QUIKTRAN real-time computer terminal. Measurements were made of (p,n) reaction cross sections for 15.1- and 18.5-Mev protons on Be, N, Al, Fe, In, Ta, and Pb at angles of 0 to 170° and neutron energies above 0.8 Mev. (S.F.L.)

46934 (ORNL-RSIC-15) BIBLIOGRAPHY OF THE COMPUTER CODES LITERATURE EXAMINED BY THE RADIATION SHIELDING INFORMATION CENTER. Maskewitz, Betty F. (comp.); McGill, Betty L.; Gurney, Jane (eds.) (Oak Ridge National Lab., Tenn.). Oct. 1966. Contract W-7405-eng-26. 64p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Literature is covered which describes not only shielding computer codes, but nuclear codes in a fringe area of shielding, and some miscellaneous information which might be of general interest. The reports are grouped according to the originating installations, with the report number listed in alphabetical and/or numerical order. The computer for which a code was written and the programming language in which it was written are indicated. (W.D.M.)

46935 (ORNL-TM-1603) EXPERIMENTAL VERIFICATION OF A GEOMETRICAL SHIELDING TRANSFORMATION. Jung, Lincoln (Oak Ridge National Lab., Tenn.). Sept. 1966. Contract W-7405-eng-26. 72p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

Thesis. Submitted to Univ. of Tennessee, Knoxville.

An experimental verification of the validity of the attenuation kernel in lid-tank-type geometry has been performed at the Lid Tank Shielding Facility at the Oak Ridge National Laboratory. The theory, based upon the attenuation kernel concept, proposed for this investigation states that the axial dose rates of the Lid Tank 28-in.-diam source is predictable from measurements with smaller sources. The axial thermal-neutron fluxes in a water medium were measured from sources of 7, 9.33, 14, and 19.80 in. diameters. The results obtained from the smaller disk sources showed a maximum deviation of 10.6%, with an agreement of 2.7% in the average of the deviations. (auth)

46936 (ORNL-TM-1632) $^{238}PuO_2$ NEUTRON SHIELDING COMPUTATION COMPARISONS. Unger, W. E. (Oak Ridge National Lab., Tenn.). Aug. 30, 1966. Contract W-7405-eng-26. 17p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Calculations by ANISN, an S_nP_l code, are compared with those by Monte Carlo and RENUPAK, a moments code. $^{238}PuO_2$ neutron dose rates in various shielding materials calculated by ANISN are presented. (auth)

46937 SHIELDING FOR SMALL NEUTRON GENERATORS. Bevan, John S. (Borough Polytechnic, London). Health Phys., 12: 1503-4(Oct. 1966).

An accelerator/generator (Van de Graaff AN400) was installed with all its ancillary equipment in a room 4.5 × 6 m, one wall of which abutted on a public access corridor. The shield was constructed of 60 cm of water 50 cm of concrete, with the water inside to provide in addition a thermal facility. (W.D.M)

46938 BACKSCATTERING OF GAMMA RAYS. Hyodo, Tomonori (Kyoto Univ.). Nippon Genshiryoku Gakkaishi, 8: 371-81(July 1966). (In Japanese).

A general survey of theoretical and experimental studies on the backscattering of γ rays is presented. Typical data of albedos and the reflection buildup factor dose of scattered γ rays are shown. (auth)

46939 DIRECT COMPARISON OF THE PENETRATION OF SOLIDS BY POSITRONS AND ELECTRONS. Takhar, P. S. (Royal Military Coll. of Canada, Kingston). Phys. Lett., 23: 219-21(Oct. 17, 1966).

A new experimental technique was used to investigate the absorption of 1.88-Mev positrons and 1.77-Mev electrons in C, Al, Cu, Sn and Pb. The results, which extend to two percent transmission of positrons, indicate greater transmission of positrons than electrons, in qualitative agreement with multiple scattering theory. (auth)

Solid State Physics

See also CHEMISTRY — Inorganic and Physical Chemistry
METALS, CERAMICS, AND OTHER MATERIALS — Properties and Structure

Refer also to abstracts 46094, 46509, 46802, and 46886.

46940 (AD–640317) PRELIMINARY INVESTIGATION OF THE STRUCTURAL PROPERTIES OF LITHIUM FLUORIDE SINGLE CRYSTALS. Miller, L. D. (Naval Radiological Defense Lab., San Francisco, Calif.). Sept. 6, 1966. 26p. (USNRDL-TR-1067). CFSTI $2.00 cy, $0.50 mn.

The initial work performed in establishing a correlation between the solid state structure of lithium fluoride and the thermoluminescence produced by interaction with ionizing radiation is described. Single crystals of lithium fluoride containing large concentrations of magnesium were grown in an attempt to determine the effects of this activator on the kinetics of thermoluminescence. The method of crystal growth and subsequent analysis of the crystals produced are discussed. The production of F centers by means of x rays and by ultraviolet light of short wavelength is described. Light sources for producing ultraviolet light are discussed. The instrumentation produced for this study and future plans are discussed. (auth)

46941 (ANL–7237) VIBRATIONS OF DEFECTS IN LATTICES. Five Lectures. Elliott, R. J. (Argonne National Lab., Ill.). July 1966. Contract W-31-109-eng-38. 42p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Notes from a series of five lectures on the vibrations of defects in crystals are presented. The lectures review many theoretical ideas current in research on vibrations in imperfect crystals. Principally, they relate the classical Green's-function techniques of Lifshitz and others to the more modern thermodynamic Green's-functions methods. The lectures cover perfect and imperfect crystals and Green's functions, solutions of the perturbed dynamical matrix (electron and magnon analogies), response of a system to a force and double-time Green's function, physical results from a double-time Green's-function treatment, and physically more realistic models. (W.D.M.)

46942 (NYO-2150-18) ESR OF THE EXCITED ^2E LEVEL OF Cr^{3+} AND V^{2+} IN MgO. Chase, Lloyd L. (Cornell Univ., Ithaca, N. Y. Lab. of Atomic and Solid State Physics). Sept. 1966. Contract AT(30-1)-2150. 13p. (CONF-660929-1). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From Conference on Optical Properties of Ions in Solids, Baltimore, Md.

The magnetic resonance of the ^2E level of Cr^{3+} and V^{2+} has been investigated in the cubic field of MgO. Interactions with higher-lying levels of the d^3 configuration lead to a magnetic splitting of the orbital states of ^2E which appears in the observed resonances as an absorption band having a width at 24 Gc ranging from 12 to 800 gauss as a function of magnetic field orientation. This result is explained on the basis of initial splitting of ^2E by random strain. A hyperfine spectrum is observed for V^{2+} for which the hyperfine constant is in reasonable agreement with the expected orbital hyperfine contribution. (auth)

46943 (ORNL-TM-1573) ULTRASONIC MEASUREMENT OF THE NON-LINEARITY PARAMETERS OF COPPER SINGLE CRYSTALS. Gauster, Wilhelm Belrupt (Oak Ridge National Lab., Tenn.). Sept. 1966. Contract W-7405-eng-26. 105p. Dep. mn. CFSTI $4.00 cy, $0.75 mn.

Thesis.

The nonlinearity parameters of neutron-irradiated copper single crystals were determined by measuring quantitatively the harmonic distortion of pulsed MHz. ultrasonic waves propagating in three crystallographic directions. For this purpose a capacitive detector was developed with which it is possible to detect and measure absolutely ultrasonic displacement amplitudes of the order of 10^{-10} cm. As verification of the technique, measurements on a single crystal of germanium were made. The results are in good agreement with those obtained for the same sample by another technique. The results of the copper experiments are combined with three published sets of values of the pressure derivatives of the second-order elastic constants to calculate three sets of the six third-order elastic constants. The problem of error propagation in this calculation is discussed. (auth)

46944 RADIATION EFFECTS IN INORGANIC SOLIDS. Di Martini, Raymond G. (Port of New York Authority, New York); Huang, Suei Rong. Advances Nucl. Sci. Technol., 3: 205-32(1966).

A brief survey is presented on radiation effects studies in various inorganic solids such as: alkali metal azides, oxyhalides, alkali metal carbonates, metallic halides, alkali and alkaline earth metal nitrates, metallic sulfates, and metallic permanganates. (M.O.W.)

46945 DEFECTS RETAINED BY TEMPERING IN IRON-NICKEL ALLOYS. Chamberod, Andre; Chambron, William; Pauleve, Jean (CEN, Grenoble, France). Compt. Rend., Ser. B, 263: 348-51(Aug. 1, 1966). (In French).

After 2-Mev electron irradiation, the diffusion state due to the hole mechanism was investigated in Fe-Ni alloys containing from 50 to 90% Ni by retaining, through tempering, an important concentration of defects from which to measure the magnetic permeability. The iron and nickel filaments were heated by the Joule effect up to the fusion zone under an atmosphere of H, He, Ar, or N_4 and were then tempered in some water or mercury. Immediately after tempering, the filaments were wound at room temperature on a spool for measuring the magnetic lag. The whole thing was then cooled to liquid nitrogen temperatures. Then it was linearly reheated under vacuum from this temperature up to about 300°C. The magnetic permeability was then studied in a weak field. It was found that a diffusion state exists between 70 and 110°C due to the holes retained in tempering. At higher temperatures, this is followed by more complex phenomena. (G.O.Y.)

46946 GENERAL TIME EFFECT OF THE SCHOTTKY TYPE. Cantarell, I. (Puerto Rico Nuclear Center, Mayaguez). pp 87-90 of I Conferencia de Espectroscopia Nuclear y Fisica del Estado Solido. Lima Organizacion de Universidade Catolicas de America Latina, 1964.

A proposed Schottky-type general time effect is verified by data for time decay of thermionic emission in (Ba-Sr)O, by experimental data from recombination and trapping in unirradiated and electron-irradiated Si, optical activation, and transient space-charge limited currents, and by studies of emission or conductivity induced by bombardment of thin layers of MgO or $Al_2O_3-Cs_2O$. The proposed theory is used to calculate effective work functions or energy levels for the above processes. (J.S.R.)

46947 VARIATION OF INTERNAL FIELDS PRODUCED BY GAMMA IRRADIATION OF TRIGLYCINE SULFATE CRYSTALS IN WEAK ALTERNATING FIELDS. Gonzalo, J. A. (Centro Nuclear de Puerto Rico, Mayaguez); Cantarell, L; Brusi, J. M. pp 115-16 of I Conferencia de Espectroscopia Nuclear y Fisica del Estado Solido. Lima, Organizacion de Universidade Catolicas de America Latina, 1964. (In Spanish).

Crystals of triglycine sulfate were irradiated with ^{60}Co γ rays and alternating fields slightly above saturation were applied during a long period of time. The hysteresis cycle was doubled after irradiation. Prolonged exposure to alternating fields progressively attenuated the artificial polarization induced by the γ radiation. The γ-induced polarization partially reduced the spontaneous polarization. (J.S.R.) (J.S.R.)

46948 ENERGY LEVELS OF Er^{3+} AND Pr^{3+} IN HEXAGONAL $LaBr_3$. Kiess, N. H.; Dieke, G. H. (Johns Hopkins Univ., Baltimore). J. Chem. Phys., 45: 2729-35 (Oct. 15, 1966).

The spectra of Er^{3+} in $LaBr_3$ are similar to, but not the same as, those of Er^{3+} in $LaCl_3$. The Stark splittings of the Y and Z groups are used to determine the crystalline-field parameters for $LaBr_3$, which are $B_2^0 = 117$, $B_4^0 = -39.6$, $B_6^0 = -19.2$, and $B_6^6 = 212$ cm^{-1}. These are significantly different from those of $LaCl_3$. The centers of gravity of the excited Stark groups are higher in $LaCl_3$ than in $LaBr_3$, and this shift increases with increasing wave number. Spectra and energy levels of Pr^{3+} in $LaBr_3$ are also given. (auth)

46949 HALL EFFECT IN HOLMIUM. Volkenshtein, N. V.; Fedorov, G. V. (Institut Fiziki Metallov, Sverdlovsk, USSR). Fiz. Tverd. Tela, 8: 1895-8(June 1966). (In Russian).

The field and temperature dependences of the Hall effect in Ho were found to parallel those of the other rare earth metals. The dependence of the mean EDS of Hall on induction in the sample is illustrated at several characteristic temperatures; for most temperatures below 178°K the dependence is inverse, but at 4.2°K there is a min at 10,000 gauss. The greatest dependence appears near 100°K; at 78°K, with a linear dependence, the value at 26,000 gauss is -10.0×10^{-8} ohm cm. Data are also plotted for the dependence of the Hall EDS on temperature at two values of induction, 10,000 and 20,000 gauss, in the sample; the min occurs at about 100°K in both cases. Below 20.4°K behavior is ferromagnetic; above this temperature, antiferromagnetic at the temperatures studied. The dependence of the effective Hall coefficient R_0^* on $(Z = (4\pi c)/(T - \theta + 4\pi c))$ for temperatures below the antiferromagnetic transition (290°K) is illustrated. Below 160°K 0.9 electron/atom effectively carries the current. The dependence on field and temperature is similar to those of Dy and Er. (BBB)

46950 CONCERNING THE ENERGY LEVELS OF DEFECTS CAUSED BY FAST NEUTRONS IN p-TYPE SILICON. Konozenko, I. D.; Eritsyan, G. N.; Khivrich, V. I. (Inst. of Physics, Academy of Sciences, Ukrainian SSR). Izv. Akad. Nauk Arm. SSR, Fiz., 1: 125-7(1966). (In Russian).

An investigation was made to determine the nature of the energy levels in the forbidden zone of p-type silicon produced by radiative defects appearing due to irradiation with fast neutrons. Specimens $1.5 \times 3 \times 10$ mm with a resistivity of 80 Ω-cm (alloyed with boron) and a dislocation density

of 10^4 cm^{-2} with oxygen concentrations of 10^{18} cm^{-3} and 10^{16} cm^{-3} were polished and etched. The specimens were irradiated with fast neutrons in a reactor at 60°C. The thermal neutrons were screened with a cadmium filter. Gamma rays accounted for 4% of the radiation. All specimens were irradiated with a dose of 6.6×10^{18} n/cm^2 under similar conditions. The specific resistance of the first type of specimens (oxygen concentration, 10^{18} cm^{-3}) increased up to 1.3×10^6 Ω-cm; that of specimens of the second type (oxygen concentration, 10^{16} cm^{-3}) increased up to 10^6 Ω-cm. The hole mobility decreased almost equally for both types of specimens, i.e., from 220 to 20 cm^2/sec. Measurements of the Hall effect for both types of specimens showed that irradiation with fast neutrons sharply decreased the concentration of holes (by almost two orders) and lead to the appearance of radiative defects of the donor impurity type which created new electron levels with depths of $E_v + 0.45$ ev (±0.01 ev) and $E_v + 0.42$ ev (±0.01 ev) for the first and second types of specimens, respectively. The defects, which were stable up to 300C, annealed at 400C. The $E_v + 0.29$ ev level, with a small concentration (2.74×10^{13} cm^{-3}) appeared at this point. The effectiveness of the defect formation caused by fast neutrons is 10^{-4} cm^{-1}. Since the specimens had a similar small density of dislocations, the assumption can be made that the given energy levels do not belong to defects localized on the dislocations. (ATD)

46951 EFFECTS OF IRRADIATION WITH PROTONS ON THE ELECTRICAL PROPERTIES OF Bi_2Te_3. Chaudhari, P.; Bever, Michael B. (Massachusetts Inst. of Tech., Cambridge). J. Appl. Phys., 37: 4181-8(Oct. 1966).

Single crystals of p-type Bi_2Te_3 were irradiated near room temperature with 7.5-Mev protons. The Hall coefficient increased while the Hall mobility and the magnetoresistance coefficient decreased with increasing radiation dose; irradiation with 1.2×10^{16} protons per cm^2 changed the compound from p type to n type. Agreement between the experimental and calculated values of the resistivity was obtained if the resistivity was assumed to be due predominantly to ionized imperfection scattering and lattice scattering. The number of defects introduced by the irradiation calculated from the experimental data was more than an order of magnitude smaller than the numbers calculated from theories of radiation damage. (auth)

46952 ANNEALING OF DISLOCATION PINNING CENTERS IN THE TEMPERATURE RANGE 120 DEG TO 180 DEG K IN ALKALI HALIDE CRYSTALS. Shaw, R. W.; Mackay, W. F.; Woo, D. S.; Welsh, W.; Dionne, G. (Rensselaer Polytechnic Inst., Troy, N. Y.). J. Appl. Phys., 37: 4256-60(Oct. 1966).

The ultrasonic attentuation of several alkali halides was studied at temperatures between 120° and 180°K and at frequencies of 10 and 30 Mc/sec. The effects of γ irradiation and light in pinning and unpinning dislocations are in agreement with the observations at lower frequencies of Bauer and Gordon. In addition a thermal annealing of the γ-ray-induced pinning was found in NaCl, KCl, and, to a limited extent, in KI. The effect was not present to a measurable extent in NaBr or KBr. The annealing is analyzed in terms of a concentration of pinning points that appear to anneal with two activation energies in NaCl and in KCl, all in the range from 0.01 to 0.15 ev. The model of Bauer and Gordon is followed in suggesting that the anneal is related to the changes occurring in this temperature range in the V bands and that the activation energies may correspond to thermal ionization of holes from V centers. (auth)

46953 HOT ELECTRON EMISSION FROM SILICON p-n JUNCTIONS PRODUCED BY ION IMPLANTATION. Meyer, N. I.; Jensen, F. Palmgren (Technical Univ. of Denmark, Lyngby). J. Appl. Phys., 37: 4297-8(Oct. 1966).

Shallow p-n junctions were produced by bombarding p-type Si by 15- to 45-kev Cs and Na ions. Results of measurements of the current-voltage characteristics and the magnitude of the emission current as a function of the neutral layer thickness as shown. (A.G.W.)

46954 MAGNETIC STRUCTURES OF TbC_2 AND HoC_2. Atoji, M. (Argonne National Lab., Ill.). Phys. Lett., 23: 208-9(Oct. 17, 1966).

Neutron diffraction data show that in TbC_2 and HoC_2 a short-range magnetic order develops below 400 and 320°K and an a-axis modulated antiferromagnetic long-range order starts at 66 and 26°K, respectively. In TbC_2, another complex magnetic structure coexists below 30°K. (auth)

46955 NATURE OF THE ELECTRON-MICROSCOPE OBSERVED DEFECT IN NEUTRON-IRRADIATED Cu. Ruehle, M.; Wilkens, M. (Max-Planck-Institut fuer Metallforschung, Stuttgart). Phys. Status Solidi, 16: K105-8 (Aug. 1, 1966). (In German).

The type of displacement rings found in neutron-irradiated Cu (vacancy type or interstitial lattice atom type) was studied by electron microscopy. The results showed that the black-white contrast depends for the most part on Frank displacement rings. These displacement rings are of the vacancy type. No interstitial lattice atom rings were found in the approximately 200 black-white contrast evaluated. (J.S.R.)

46956 DETECTION AND ORIGIN OF INTERSTITIAL LATTICE ATOM AGGLOMERATES IN ION-IRRADIATED Cu FOILS. Diepers, H.; Diehl, J. (Max-Planck-Institut fuer Metallforschung, Stuttgart). Phys. Status Solidi, 16: K109-12(Aug. 1, 1966). (In German).

Copper foils, after irradiation with 5-kev Ar ions, were examined with an electron microscope. The agglomerate configuration of the radioinduced defects was determined. The quasi-symmetrical axes of the black points are, in general, not paralled to the diffraction vector but parallel to a ⟨110⟩ direction. The agglomerates lie about $t_D \approx 140$ Å under the irradiated surface within a relatively thin layer of about 30 Å. The defects are stacked circles of confusion built from interstitial lattice atoms. The origin of the defects is attributed to channel effects and the range of the crowd ions is estimated. (J.S.R.)

46957 EFFECT OF γ AND FAST-NEUTRON RADIATION ON THE ELECTRICAL PROPERTIES OF CADMIUM SULFIDE SINGLE CRYSTALS. Galushka, A. P.; Ermolovich, I. B.; Korsunskaya, N. E.; Konozenko, I. D.; Sheinkman, M. K. (Inst. of Physics, Kiev. Inst. of Semiconductors, Kiev). Soviet Phys.-Solid State (Engl. Transl.), 8: 831-7(Oct. 1966).

Translated from Fiz. Tverd. Tela, 8: 1040-8(Apr. 1966).

The effects of γ and fast-neutron radiation on the dark resistivity, photosensitivity, majority carrier mobility and its temperature dependence, recombination kinetics, thermally stimulated conductivity spectra, infrared quenching, and luminescence of CdS crystals, produced by sublimation with multiple temperature zones, were investigated. It is shown that γ irradiation leads to predominantly acceptor-type defects whereas neutron irradiation leads to predominantly donor-type defects. The effects of such defects on the characteristics enumerated above were studied. (auth)

46958 SPECTRA AND KINETICS OF THE PHOTOCONDUCTIVITY OF p- AND n-TYPE GERMANIUM CRYSTALS IRRADIATED WITH FAST ELECTRONS AT 100 AND 5.2 DEG K. Akimchenko, I. P.; Ginzburg, M. I.; Plotnikov, A. F. (Lebedev Inst. of Physics, Moscow). Soviet Phys.-Solid State (Engl. Transl.), 8: 932-7 (Oct. 1966).

Translated from Fiz. Tverd. Tela, 8: 1168-75(Apr. 1966).

A study was made of the photoconductivity spectra of p- and n-type crystals having residual impurity concentrations not higher than 8×10^{12} cm^{-3}, irradiated with fast electrons at 100 and 5.2°K. The irradiation at 5.2°K produced defects in the p- and n-type crystals, which gave rise to the same system of four levels in the forbidden band: $E_v + 0.22$, $E_v + 0.36$, $E_v + 0.42$, and $E_v + 0.62$ ev. The cross sections for the capture of holes by the $E_v + 0.22$, $E_v + 0.36$, and $E_v + 0.42$ ev levels at 5.2°K were deter-

mined. It was assumed that all four levels were due to simple defects. (auth)

46959 TEMPERATURE DEPENDENCE OF THE AVERAGE IONIZATION ENERGY IN GERMANIUM AND SILICON. Geitsi, I. I.; Nesterov, A. A.; Barinova, E. Yu.; Smirnov, L. S. (Inst. of Semiconductor Physics, Novosibirsk, USSR). Soviet Phys.-Solid State (Engl. Transl.), 8: 990-2(Oct. 1966).

Translated from Fiz. Tverd. Tela, 8: 1246-9(Apr. 1966).

A study of the temperature dependence of the average ionization energy in Ge and Si during irradiation with x rays (30 to 50 kev) showed that the average ionization energy in Ge and Si is not greatly affected by cooling from 300 to 77°K. The observed changes can be accounted for by changes in the forbidden band width. (auth)

46960 VARIATION OF THE ELECTRICAL RESISTANCE OF TITANIUM FILMS UNDER ARGON ION BOMBARDMENT. Ivanovskii, G. F.; Radzhabov, T. D. Soviet Phys.-Solid State (Engl. Transl.), 8: 1013-14(Oct. 1966).

Translated from Fiz. Tverd. Tela, 8: 1271-3(Apr. 1966).

Argon ions between 0.8 and 4 kev and a current of up to 10 μamp were used to study the variation of the electrical resistance of Ti films condensed in high vacuum. It was found that the variation of the electrical resistance depends on the thickness of the irradiated layer and the energy and number of bombarding ions. With increasing thickness of the layer the resistivity decreases, approaching asymptotically the resistivity of massive metal. The change in resistance reaches its maximum value at ion energies of 2 to 2.5 kev, which corresponds to sorptional saturation. With increasing numbers of bombarding ions sorptional saturation corresponding to the maximum change in the resistance, is also reached. The interaction between the interstitial argon atoms and Ti can apparently be considered as purely mechanical. (A.G.W.)

46961 EFFECT OF X RADIATION ON ELECTRIC CONDUCTIVITY OF THIN α-HgS FILMS. Dutchak, Ya. I.; Mikolaichuk, A. G.; Kogut, A. M. Ukr. Fiz. Zh., 11: 978-81(1966). (In Ukrainian).

A procedure is described for obtaining films of a trigonal modification of mercury sulfide by evaporation in vacuum of artificial α-HgS samples. The effect of x radiation on the conductivity of thin films was investigated. The radiation sources were tubes with anticathodes of Cr, Fe, Co, Cu, and Mo. The x-ray dose impinging on the sample was determined by means of the PM-1-M dosimeter. It is shown that the photocurrent value depends on the dose and wavelength of the characteristic radiation and increases with an increase in the latter. The continuous radiation short wave spectrum does not substantially affect the photocurrent value. These data indicate that with a small film thickness the photoconductivity of the sample is determined, first of all, by the linear absorption coefficient, and not by the quantum yield and life of the current carrier. (auth)

46962 SINGLE CRYSTAL DIFFRACTOMETRY. Arndt, U. W.; Willis, B. T. M. Cambridge Monographs on Physics. New York, Cambridge University Press, 1966. 343p. $15.00.

Counter methods of measuring the intensities of Bragg reflections for the determination of a crystal structure are treated. All aspects of single-crystal diffractometry are covered. A discussion of the geometrical principles of diffraction by single crystals is followed by a description of diffractometers and of their component parts, including radiation detectors and detector circuits. Methods for producing incident x-ray and neutron beams of optimum divergence and wavelength composition are described next, followed by the procedure for measuring the diffracted intensities. The derivation of structure factors from the experimental observations is covered, with particular attention given to the effect of random and systematic errors on the observations. X-ray and neutron methods are contrasted throughout. (L.B.S.)

REACTOR TECHNOLOGY

General

Refer also to abstracts 46140 and 46141.

46963 (ANL–7132) REACTOR DEVELOPMENT PROGRAM PROGRESS REPORT, DECEMBER 1965. (Argonne National Lab., Ill.). Jan. 25, 1966. Contract W-31-109-eng-38. 89p. Dep. mn. CFSTI $3.00 cy, $0.75 mn.

The development and operation of EBR-II is described and the termination of FARET activities is announced. Fast reactor physics experiments are described for the various zero-power facilities, and fast reactor fuel and fuel reprocessing progress is reported. Experimental and theoretical reactor physics developments, high-temperature materials studies, nondestructive testing of fuels and materials, engineering development, fluidization and volatility separations processes, characteristics of C impurities in Na, worth measurements of the central control rod and boric acid for a Pu-bearing fuel assembly, and the temperature coefficient of reactivity for the same assembly are examined. Research and development work on the Argonne Advanced Research Reactor and on regenerative emf cells is presented. Nuclear safety studies included reactor kinetics experiments, TREAT operations, and metal-water reactions experiments. (H.D.R.)

46964 (BNWL–284) PHYSICS RESEARCH QUARTERLY REPORT, JANUARY–MARCH 1966. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). Contract AT(45-1)-1830. 26p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Progress is reported on various aspects of reactor physics studies. The following subjects are presented in separate papers: computer program LIKELY to construct maximum-likelihood nonlinear vector fields, sensitivity of thermal reactor parameters to scattering model, computer analysis of reactor noise data, sensitivity of reactor multiplication values to cross section uncertainties for thermal systems, Lu activations and spectral indices in a D_2O-moderated reactor with Pu–Al 19-rod clusters, and reactivity worth of neutron absorbing rods in Pu-fueled, H_2O-moderated systems. (H.D.R.)

46965 (EURAEC–1608) BOILING WATER REACTOR STABILITY STUDIES. Quarterly Report No. 5, January 1–March 31, 1966. Hoeld (Kernenergieanlagen, Allgemeine Elektricitaets-Gesellschaft, Frankfurt am Main (West Germany)). 28p. (EUR–2821). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

As part of the current series of measurements being carried out, the stationary local steam bubble content and frequency range output — local steam bubble content were determined at three different positions along the boiling zone of the annulus test section of the AEG instability testing rig, and under a series of different test conditions. After overcoming a few running-in difficulties, caused by the length of time during which the testing rig had been at a standstill, it was possible to carry out the first third of the measurement program envisaged. The evaluation of the measurement data was effected with the help of a computer program. A part of the measurement results is reproduced in the form of tables and diagrams. A computer program, which was developed for the IBM 7040 digital computer from the analytical model adapted to the data of the testing rig during previous report periods, has been named AMOK-L. This program is intended to make it easier in the future to analyze theoretically the experimentally found frequency ranges. (auth)

46966 (NAA-SR–12010) ANNUAL TECHNICAL PROGRESS REPORT, AEC UNCLASSIFIED PROGRAMS, FISCAL YEAR 1966. (Atomics International, Canoga Park, Calif.). Aug. 31, 1966. Contract AT(11-1)-Gen-8. 298p. Dep. mn. CFSTI $7.00 cy, $1.50 mn.

Fast reactor development activities included a secondary Na-steam system parameter study, boiling studies for Na reactor safety, UC fuel irradiation, and stability and property studies of cladding and structural alloys in a high-temperature, liquid metal, fast neutron environment. Assessment of the safety, design, and operational reliability of the Sodium Reactor Experiment was continued. The operation of the Sodium Component Test Installation was limited by failure of major system components. A Liquid Metals Information Center was established. Various materials and mechanical devices, including strain gages, spur gears, and journal bearings, were tested in high-temperature sodium. Piqua Nuclear Power Facility development activities included fabrication of Core II, SAP-clad, UC fuel elements, Core II design, and design of a catalytic hydrocracking coolant processing system. Extrapolation lengths and neutron diffusion lengths were measured in graphite and water and pulsed neutron decay measurements in diphenyl were completed. Existing experimental and theoretical data on neutron cross sections were surveyed, compiled, and evaluated, and a number of neutronic computer codes were written or modified. Measurements were obtained on the Doppler effect in a fast reactor spectrum, and a computer code is being developed for the calculation of region-dependent spectra for fast reactors. Reactor fuels and materials studies included structure, properties and fission effects in UC and other refractory, interstitial fuels, refractory moderator materials development, fission effects in metal fuels, and synthesis, structure, and behavior of metal-hydrogen systems. Sodium chemistry development was concentrated on methods for the preparation of ultrapure Na and analysis techniques for impurities in Na. A high-flux heater to simulate fast-reactor fuel pins was built and tested. Development of the digital dynamics simulator AIROS was continued, and TRIX code calculations of the Doppler coefficient of reactivity and associated resonance parameters were compared with measured values. The ability of Na reactor coolants to retain specific fission products released to the coolant stream and the behavior of these fission products in the coolant were investigated. Extensive experiments were conducted on the characterization of Na fires and the release and transport of effluents and energy in a primary coolant accident. An analytical model was developed for calculation of energy and gas transport resulting from a Na fire. The high-temperature physico-chemical properties of fused salts and metal-metal salt solutions were studied, and the fundamental physico-chemical processes occurring in the radiolysis of organic systems were investigated. Work was continued on various aspects of superconductivity in metals and alloys, and radiation damage and recovery processes were examined for metals, alloys, and semiconductors. (H.D.R.)

46967 SYNTHESIS METHODS IN REACTOR ANALYSIS. Kaplan, S. (Westinghouse Electric Corp., West Mifflin, Pa.). Advances Nucl. Sci. Technol., 3: 233-66(1966). (WAPD-T–1810).

A collection of methods for solving various problems in reactor theory is described. The unifying idea is to reduce the number of independent variables by constructing an approximate solution in the form of a linear combination of known functions of one or more of the variables, with the coefficients of combination being functions only of the remaining variables. One of the important applications of the described approximation methods is solving the neutron group diffusion equations in three dimensions with great spatial detail. (H.D.R.)

46968 REACTOR CALORIMETRY. Kott, J. Jad. Energ., 12: 289-95(1966). (In Czech).

A brief description of the mechanism of radiation damage and heating of construction materials in a reactor radia-

tion field, the importance of these effects from the point of view of reactor operation, and recent possibilities of the application of computers in determining the amount of energy absorbed in materials are given. The calorimetric methods of reactor dosimetry were conveniently classified and fundamental physical formulas for individual calorimetric arrangements and various measurement methods were established. The different design modifications of reactor calorimeters and respective measurement methods used recently are reviewed. A classification of calorimetric measurements is discussed together with the evaluation of results with respect to measurement categories. (auth)

46969 NUCLEAR ENERGY AND NUCLEAR TECHNOLOGY IN CANADA. Leaist, G. T. (Dept. of Trade and Commerce, Ottawa). Neue Tech., 8: 178-81(1966).

Major developments in the Canadian nuclear energy program are reviewed. The CANDU-Pressurized Heavy Water and CANDU-Boiling Light Water Reactor concepts are described and their application to power production is discussed. Whiteshell Reactor No. 1 development and testing is described, commercial products activities are summarized, and heavy water plant construction is discussed. (H.D.R.)

46970 POSSIBILITY OF CHEMONUCLEAR REACTORS PRODUCING OZONE FOR WATER TREATMENT. Beller, Morris; Steinberg, Meyer (Brookhaven National Lab., Upton, N. Y.). Nucl. Appl., 2: 237-8(June 1966).

Ozone produced by irradiation of air or O_2 is proposed for use in water purification and pollution control. Nuclear reactor requirements for typical water-treatment situations are presented, and costs are estimated. (auth)

46971 INFLUENCE OF THE CHOICE OF COOLANT GAS ON REACTOR THERMAL PERFORMANCE. Melese, Gilbert (General Atomic Div., General Dynamics Corp., San Diego, Calif.). Nucl. Appl., 2: 205-12(June 1966).

The thermodynamic performance of coolant gases is compared for given pressures and temperatures and for the same maximum surface temperature of the fuel element. Two relations allow comparison of power output and channel dimensions for different gases and various operating conditions such as fixed ratio of pumping power-to-thermal power. Except for steam, the relative merit of gases is found to depend more on temperature than on pressure. From a thermal viewpoint, the conditions under which coolants are compared may alter the order of preference of gases such as He or CO_2. (auth)

46972 NUCLEAR SAFETY. Volume 7, Number 4. Cottrell, Wm. B.; Jordan, W. H.; Blakely, J. P. (eds.). Contract W-7405-eng-26. One of the five Quarterly Technical Progress Reviews published for the Division of Technical Information, USAEC. Oak Ridge National Lab., Tenn., Summer 1966. 125p. GPO $1.00 Domestic, $1.20 Foreign.

Separate abstracts were prepared for 18 of the 21 sections presented. Three sections were in summary form and were not abstracted for NSA. (B.G.D.)

For abstracts of individual sections see: 45410, 45985–45990, 46973, 46974, 46985, 46997, 46998, 47001, and 47033–47037.

46973 DETECTION OF BOILING IN WATER-MODERATED NUCLEAR REACTORS. Saxe, R. F. (North Carolina State Univ., Raleigh). Nucl. Safety, 7: 452-6 (Summer 1966).

The ability to detect the onset of boiling in some water-moderated reactors would be of value in that it would make it possible for these reactors to be operated at a higher power than would otherwise be considered because of the danger of boiling burnout. The conditions that make such detection difficult are discussed, and the attempts at the detection of the onset of boiling recorded in the literature are analyzed. An attempt is made to assess the relative promise of the detection methods so far suggested. (auth)

46974 PROGRESS SUMMARY OF NUCLEAR SAFETY RESEARCH AND DEVELOPMENT PROJECTS. Murphy, C. M. Nucl. Safety, 7: 498-509(Summer 1966).

The summary of nuclear safety research and development projects includes light-water reactor safety, fast sodium reactor safety, gas-cooled reactor safety, transportation and storage, radionuclide release and movement in the environment, operational safety, and general safety studies. (B.G.D.)

46975 IMPACT OF FAST BREEDERS ON URANIUM RESOURCES. Stoller, Sidney M. (S. M. Stoller Associates, New York). 5p. (CONF-660220–1). ORAU. Gmelin, AED-CONF-66-022-3.

From American Nuclear Society, Canadian Nuclear Assn., Nuclear Energy Resources Meeting, Toronto, Canada.

The relations of increased use of power, the use of breeder reactors, and U resources are discussed. It is concluded that the U supply does not make breeder development an urgent matter. Motivation for breeder development is based on favorable data on breeder economics. Breeders also represent a better use of Pu than by recycling in thermal reactors. (J.R.D.)

46976 THE MODAL SYNTHESIS OF ROSSI-ALPHA DATA FOR MODERATOR-REFLECTED FAST ASSEMBLIES. Borgwaldt, H.; Murley, T. E.; Sanitz, D. (Kernreaktor Bau- und Betriebs-Gesellschaft mbH, Karlsruhe, Ger.). Karlsruhe, Gesellschaft fuer Kernforschung mbH, 1966, 20p. (CONF-660206–20; KFK–409). ORAU. Gmelin, AED-CONF-66-014-24.

From Symposium on Neutron Noise, Waves and Pulse Propagation, Gainesville, Fla.

A method is presented for calculating the space, energy and detector dependent correlation function, which is the goal of noise analysis experiments in nuclear reactors. The diffusion and short time approximations to the dynamic Boltzmann equation are made for the sake of simplicity and clarity. A brief description is given of the salient features of the multigroup diffusion code used in these calculations, with the emphasis placed on those features required to calculate the correlation function. A simple reactor consisting of a ^{235}U spherical core surrounded by a graphite reflector was chosen to illustrate how higher modes of the correlation function may be observed in noise analysis experiments. In particular, it is seen that a Rossi-alpha experiment may measure two decay modes, corresponding to the fundamental mode and the most significant higher mode, or only the single fundamental mode, depending on the spectral sensitivity and the location of the two detectors used in the experiment. (auth)

46977 SIMPLIFIED METHOD OF EVALUATING THE NUCLEAR REACTOR ENVIRONMENT FOR THE DESIGN ENGINEER. Talbott, George (Autonetics Div., North American Aviation, Anaheim, Calif.). 12p. (CONF-660435–1). ORAU. Gmelin, AED-CONF-66-079-1.

From Institute of Environmental Sciences, 1966 Technical Meeting and Equipment Exposition, San Diego, Calif.

A simple means of evaluating thermal and ionizing energies from the fission of U atoms is presented. A basic fission equation, characteristic of the average U reactor, is written and the concept of mass defect explained. The conversion of mass of kinetic energy is discussed and the total energy of a nuclear reaction classified. A technical appendix is included in which fundamental equations are derived. (auth)

46978 NUCLEAR SAFETY ROD ACTUATOR. Winders, Gordon R. (to Babcock and Wilcox Co.). U. S. Patent 3,264,952. Aug. 9, 1966. Filed May 1, 1964.

A reactor safety rod actuator design comprising a cylinder and piston arrangement, with one end of the piston being connected to the safety rod, is presented. The internal diameter of the cylinder is smaller at each end than the diameter of the piston and larger than the piston for the distance between the ends. Fluid is introduced into one end of the cylinder and the flow rate through the restricted flow space between the piston and cylinder produces a pressure

drop sufficient to move the piston to the opposite end of the cylinder. (H.D.R.)

46979 NUCLEAR REACTOR FUELLING AND SERVICING APPARATUS. Rawson, Peter John; Woolterton, Victor; Butler, Graham John; Billingham, Kenneth Arthur (to English Electric Co. Ltd.). British Patent 1,038,133. Aug. 10, 1966. Filed May 8, 1962.

A reactor fueling and servicing machine is described which employs a self-propelled transporter whose direction of motion may be varied by jacking up the body and rotating the tire assembly. (H.D.R.)

46980 APPARATUS FOR BREAKING THE DRIVE MOTION OF A SAFETY ROD IN A GAS-COOLED NUCLEAR REACTOR. Marten, Klaus (to Gesellschaft fuer Kernforschung mbH). German Patent 1,218,079. June 2, 1966. Filed May 13, 1964.

The fall of a safety rod, the lower end of which is fixed to a piston moving in a cylinder closed at its lower end, is retarded by compressing the gas between the lower face of the piston and the lower end of the cylinder. The piston is provided with a non-return valve connecting the two volumes of the cylinder which are separated by the piston and opening at a predetermined position of the piston. (Gmelin Inst.)

Auxiliaries and Components

Refer also to abstracts 46981 and 47016.

46981 (GEAP-5147) REACTOR PRIMARY COOLANT SYSTEM RUPTURE STUDY. Quarterly Progress Report No. 4, January-March 1966. (General Electric Co., San Jose, Calif. Atomic Power Equipment Dept.). Apr. 1966. Contract AT(04-3)-189. 120p. Dep. mn. CFSTI $4.00 cy, $0.50 mn.

A stress analysis model of a typical BWR primary piping system was developed to provide input data for calculating system reliability. Initial calculations were made to determine normal stress levels in the system. The results indicate that stresses normally encountered are below code allowable values. Computer code development has continued and all necessary equations for the plate and panel elements were developed and programmed. A series of low-C steel impact specimens were prepared for investigation of the effect of side notching on measured crack toughness and the effect of nitriding. Development of a procedure to calculate the strain energy release rate (G) as a function of crack length for a circumferentially-cracked straight pipe section under combined pressure and bending loads was initiated during the period. Fatigue crack growth rate studies have continued. Experimental work consisted of measurement of cyclic crack growth in wide plates of 2¼ Cr-1 Mo steel at room temperature and at 540°F, and in Type-304 stainless steel at room temperature. Preliminary results indicate a small but significant increase in crack growth rate in the low alloy steel at 540°F. The type-304 stainless steel tests show a very significant influence of crack shape geometry; as crack-length-to-depth-ratio increases, the crack growth rate increases. In the crack initiation studies, fatigue testing of edge-notched flat-plate specimens was completed. C steel and 2¼ Cr-1 Mo steel specimens endure about 120,000 cycles at a nominal stress equivalent to their respective yield strengths. Type-304 stainless steel specimens fail after 35,000 cycles at a stress level equivalent to its yield strength. At higher stresses, the type-304 stainless steel has a higher fatigue life relative to the other two materials. (J.R.D.)

46982 (IITRI-578P21-21) STUDIES OF REACTOR CONTAINMENT. Bimonthly Progress Report, June 1-July 31, 1966. Gallagher, E. V. (IIT Research Inst., Chicago, Ill.). Contract AT(11-1)-578. 22p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A progress report is presented on the development of criteria for assessing the safety of nuclear reactors in the event of a malfunction of the reactor system. It covers problems on the generation of transient loads on containment structures in the event of a violent system excursion or a loss-of-coolant accident, and on the transmission and attenuation of disturbances through configuration of material surrounding the source. (B.G.D.)

46983 (ORNL-tr-1328) REACTOR PRESSURE VESSEL WITH REDUCED SECONDARY STRESSES. Hamada, Kunio Translated for Oak Ridge National Lab., Tenn., from Japanese Patent 1964-15090. 5p. Dep. mn. JCL $1.10 fs, $0.80 mf.

The joint between the main body of the pressure vessel and the lower reflecting hemisphere is designed to minimize the accumulation of stresses about this joint. In this design, a material (e.g., stainless steel) with a thermal expansion coefficient greater than that of the reflector (steel), is used in the joint area, thus reducing the difference in the expansions of the body and reflector. (D.L.C.)

46984 PNEUMATIC IRRADIATION FACILITY. Csajka, M.; Csoeke, A.; Oerdoegh, M.; Peter, I. (Central Research Inst. for Physics, Budapest). Isotopenpraxis, 2: 224-6(June 1966). (In German).

The rabbit-type pneumatic tube system providing direct connection between the core of the WWR-S type reactor and the processing laboratory, built at the Central Research Institute for Physics, is described. The irradiated targets can be extracted from the core in less than 5 sec. (auth)

46985 EXPLOSION CONTAINMENT FOR NUCLEAR REACTOR VESSELS. Proctor, J. F. (Naval Ordnance Lab., Silver Spring, Md.). Nucl. Safety, 7: 459-68(Summer 1966).

The formulation of basic explosion-containment equations for idealized water-filled right-circular cylinders is summarized. The equations express explosive charge weight as a function of vessel geometry and conventional material properties. Extensive experiments with models verified the relations for a wide range of vessel materials and sizes. The basic containment relations were amplified to characterize the response of real reactor vessels, i.e., vessels with welds, nozzles, and end constraints, to a large spectrum of postulated nuclear accidents. Additional research on reactor vessel containment and safety needed for accurate accident analysis is discussed. (auth)

46986 NEW SIMPLIFIED SOLID-STATE INSTRUMENTATION FOR THE CONTROL AND SAFETY OF EXPERIMENTAL NUCLEAR REACTORS. Kaniewski, Jacek; Grzybinski, Ryszard; Szulc, Przemyslaw (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 157-73(1966).

A brief description of simplified solid-state instrumentation for a nuclear reactor control and safety system is presented. The general concepts of the system and its behavior in different states of operation as well as some main instruments of the measuring channel are described. Special dynamic problems are discussed and some results of the dynamic experiments performed on the system model with a reactor kinetics simulator are enclosed. (auth)

46987 METHOD AND MEANS FOR RELIEVING PRESSURE IN GAS CONTAINERS CONNECTED TO NUCLEAR REACTORS. Widell, Bjoern (to Allmaenna Svenska Elektriska Aktiebolaget). German Patent 1,218,624. June 8, 1966. Priority date May 26, 1961, Sweden.

Methods are described for relieving the pressure in a gas container containing collected radioactive fission gas formed during operation in a nuclear reactor, in that the gas container is connected to several collecting vessels with openable and closable connection conduits, and that the gas container is placed in open communication with one collecting vessel at a time and the open communication between the gas container and one collecting vessel is closed after the pressure in the gas container and the collecting vessel has become substantially equal, before the gas container is placed in open communication with

another collecting vessel. The collecting vessels are arranged along a main conduit connected to the gas container. (auth)

46988 NUCLEAR REACTOR FUELING MACHINE. Hummel, Frederick S. (to Atomic Energy of Canada Ltd.). Canadian Patent 738,541. July 12, 1966.

A mechanism is described for accurately determining the position of the fuel bundles during withdrawal of spent bundles by the fueling machine. A sensing and stop device locates the position of the end of the bundle as it extends from the reactor tube into the unloading unit of the fueling machine. The ram position is unsatisfactory for determining the precise location of the junction between the adjacent ends of a pair of bundles. The control circuit and signaling mechanism are described. The sensing device is operative while a seal is maintained between the reactor tube and the machine so that coolant flow is not interrupted. (F.S.A.)

46989 IMPROVEMENTS RELATING TO VESSELS HAVING WALLS OF PRE-STRESSED CONCRETE LINED WITH METAL PLATING. Turner, Frederick Henry (to Babcock and Wilcox Ltd.). British Patent 1,041,044. Sept. 1, 1966. Filed Nov. 8, 1961.

A method of reducing or eliminating relative movement between prestressed concrete walls and their metal plate lining, such as reactor pressure vessels, is described. Compressing loads are transferred from the concrete to the edge surface of the metal plating so that in prestressing the concrete, the plating is compressed together with the concrete wall, load receiving pads mounted perpendicular to the plates of the plating are provided. (F.S.)

46990 IMPROVEMENTS IN CONCRETE PRESSURE VESSELS. Turner, Frederick Henry (to Babcock and Wilcox Ltd.). British Patent 1,041,041. Sept. 1, 1966. Filed Oct. 27, 1961.

A concrete pressure vessel consisting of an inner shell of fluidtight material enveloped by an outer wall of concrete comprising several preformed components arranged side by side in contact with the inner shell, anchored together and prestressed, is described. The pressure vessel is used as the containment vessel of a nuclear reactor. (F.S)

46991 IMPROVEMENTS IN CONCRETE WALLS. Turner, Frederick Henry (to Babcock and Wilcox Ltd.). British Patent 1,041,042. Sept. 1, 1966. Filed Nov. 8, 1961.

A method of cooling a prestressed concrete wall in a nuclear reactor pressure vessel to prevent thermal stressing of the concrete at points where it is penetrated by nozzles carrying a hot fluid is discussed. A fluid-cooled jacket surrounds the conduit and absorbs the heat which otherwise would be transmitted to the concrete wall. An annular air gap formed between the outside casing and the metal liner provides air circulation to cool the face of the concrete. (F.S.)

46992 IMPROVEMENTS RELATING TO APERTURED CONCRETE WALLS. Turner, Frederick Henry (to Babcock and Wilcox Ltd.). British Patent 1,041,043. Sept. 1, 1966. Filed Nov. 8, 1961.

Improvements in forming prestressed concrete pressure vessels with apertures of circular cross sections, such as would be used for a gas-cooled reactor, are described. A substantially rigid steel liner of material having a large elastic modulus compared with that of the concrete is provided. The aperture may be several feet in diameter. Compensation is provided in walls subjected to compression forces acting transversely on the aperture. (F.S.)

Criticality Studies

Refer also to abstracts 45728, 46557, and 46573.

46993 (DP–1054) LATTICE MEASUREMENTS ON TUBULAR FUEL ASSEMBLIES IN D_2O. Fike, Harold R. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). Aug. 1966. Contract AT(07-2)-1. 16p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Substitution measurements in the Process Development Pile (PDP) were used to determine bucklings and diffusion coefficients for D_2O-moderated lattices of tubular natural UO_2 fuel assemblies. Four types of assemblies were investigated at triangular lattice pitches of 9.33, 11.10, and 12.12 inches. Coolants within the different assemblies included D_2O, air, and mockups of H_2O fog and organic liquids. (auth)

46994 (ORNL–3272) CRITICAL MASS STUDIES. PART XI. CRITICAL PARAMETERS OF URANIUM–ALUMINUM ALLOY SLUGS. Fox, J. K.; Gilley, L. W. (Oak Ridge National Lab., Tenn.). May 28, 1962. Contract W-7405-eng-26. 27p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Critical and near-critical experiments were performed with cylindrical pieces of two alloys of 93%-^{235}U-enriched U and Al to establish safe practices in fabrication and in other procedures. In one set of experiments the U content of the alloy was 5.4 wt % and the dia of the pieces was 1.015 in. The minimum critical number of 12-in.-long slugs in a single water-reflected and -moderated tier was 134; the minimum number in a double tier was about 165. Experiments with 8-ft-long, optimumly spaced rods gave the dia of an infinitely high, unreflected cylindrical array as between 15 and 17.5 in. and as approximately 12 in. for a totally water-reflected cylindrical array. The second alloy, which was studied in detail earlier, contained 7.6 wt % U and was made into cylinders 1.35 in. in dia. The minimum number of 8-in.-long slugs which could be made critical in a square lattice was 101, arranged in two tiers, and this agreed with the earlier results. The minimum critical number in a similar hexagonal lattice was 100. A double tier of 1000 closely packed 8-in.-long slugs was subcritical when submerged in water. The dia of an infinitely long, unreflected critical cylindrical array of optimumly spaced rods was between 15 and 17.5 in.; the dia of a water-reflected cylindrical array was about 12 in. It was shown that randomly spaced slugs produce less source neutron multiplication than do lattices of the same overall density. (auth)

46995 PLUTONIUM IN NUCLEAR REACTORS. III. THE COEFFICIENT OF REACTIVITY OF Na IN LARGE FAST OXIDE REACTORS. Bucci, P. (CAMEN, Pisa, Italy). Ing. Nucl., 7: 30-41(Jan.-Feb. 1966). (In Italian).

The coefficient of reactivity of Na in Na-cooled fast Pu reactors is considered. The two factors most affecting the reactivity coefficient are the concentration of the fissile material and the presence of neutron capturing materials. The behavior of structural materials with respect to Na cooling is discussed. The nuclear and mechanical characteristics of stainless steel, Ti, Zr, Mo, W, Ta, Nb, and V are discussed. (J.S.R.)

46996 USE OF COLLISION PROBABILITY METHOD FOR THE CALCULATION OF SOME PARAMETERS OF THE REACTOR LATTICE. Kujal, Bohumir; Kujal, Josef (Inst. of Nuclear Research, Czechoslovak Academy of Sciences, Rez, Czech.). Jad. Energ., 12: 241-5(1966). (In Czech).

The collision probability method is used for the calculation of reactor core parameters. Calculations were carried out for several types of heavy water reactor cores with organic and gas coolants. The results indicated the applicability of this method to physical calculations. (auth)

46997 CRITICALITY STUDIES OF HYDROGEN-MODERATED URANIUM SYSTEMS. Newlon, C. E. (Oak Ridge Gaseous Diffusion Plant, Tenn.). Nucl. Safety, 7: 418-23(Summer 1966).

The general applicability of computational surveys in establishing criticality limits and identifying optimum criticality conditions for nuclear safety control is briefly reviewed. Recent studies made with 1-group theory, 16-

group transport theory, and a first-order solid-angle method for interacting arrays include: the infinite-medium multiplication factor, k_∞, of homogeneous hydrogen-moderated U of all ^{235}U enrichments, critical spacings of arrays of individually subcritical units in air, and the effects of composite metal–water reflectors on the minimum critical cylinder dimensions of U systems enriched to 4.98 wt. % ^{235}U. Good correlation with applicable experimental data is noted. Specific items discussed are the significance of k_∞ minima found for high-enrichment systems of undermoderated U, the ^{235}U-enrichment and -concentration limits derived from k_∞ determinations, and the inverse ^{235}U-enrichment phenomena found for both individual units and interacting arrays. (auth)

46998 STATUS REPORT ON THE SPERT PROGRAM, INCLUDING THE POWER BURST FACILITY. Kerlin, T. W. Nucl. Safety, 7: 443-8(Summer 1966).

The accomplishments of the SPERT program since the last quarter of 1963 are reviewed. All four SPERT reactors were used for transient tests designed to provide information about the dynamic behavior of reactors cooled and moderated by light water and heavy water. This work included important tests of theoretical predictions of reactor transients. During this period, operation of two of the SPERT reactors (SPERT-I and SPERT-II) was terminated upon completion of programs. New work on two reactors for destructive testing of subassemblies was accomplished. One of these reactors is the capsule-driver core in the SPERT-IV facility. The other new test reactor, the Power Burst Facility, will extend the capabilities for destructive testing of subassemblies beyond the capability of the capsule-driver core. (auth)

46999 RECENT NUMERICAL METHODS IN NEUTRON THERMALIZATION IN THE REACTOR ELEMENTARY CELL. Weiss, Zbigniew (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 99-108(1966).

It is now already well understood that the detailed analysis of the space-energy distribution of neutron flux in the reactor elementary cell is an important task of physical reactor calculations. With increasing capacity of modern digital computers the problem can be solved numerically for more and more complicated systems. The whole subject has been divided into two main groups of problems: the spatial connections (the transition matrix) and the energy distributions (the energy transfer matrix). In the first group the K-7 TRANSPO, ESPRO, RITZ and AMCLA codes are discussed. Special attention has been devoted to the problem of boundary conditions on the Wigner-Seitz cell boundary. (The white and reflective boundary conditions, neighboring fuel rods interference effects, etc.). In the second group the basic principles of the multivelocity THERMOS and SPECTROX codes are described. A third, intermediate (iterative) method, is also mentioned. Some general problems of different approximations used so far as well as scattering models are discussed. (The difficulties with consequent transport correction, in any multivelocity codes, the relation between the scattering model used and the hardness of the resultant spectrum in moderator, the comparison between the theoretical and experimental results, discussion of still existing differences, and so on.) (auth)

47000 THE TWO-DIMENSIONAL CRITICALITY CALCULATIONS: THE DIFIGREC CODES. Kulikowska, Teresa A. (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 147-56(1966).

A description of DIFIGREC — a two-dimensional few group diffusion code for the GIER computer — is presented. The main differences between the few existing versions of that code are outlined and the results of calculation for the ANNA critical assembly are presented. (auth)

47001 FUEL-ASSEMBLY CLADDING-DEFECT DETERMINATIONS USING THE "DRY SIPPING" TECHNIQUE. Blakely, J. P. Nucl. Safety, 7: 511-13(Summer 1966).

A new procedure for detecting fuel-cladding defects is summarized together with an AEC comment. (B.G.D.)

47002 KRITICHESKIE PARAMETRY SISTEM S DELYASHCHIMISYA VESHCHESTVAMI I YADERNAYA BEZOPASNOST. (Critical Parameters and Nuclear Safety of Systems with Fissile Materials). Dubovskii, B. G.; Kamaev, A. V.; Kuznetsov, F. M.; (and others). Moscow, Atomizdat, 1966. 227p.

A review is given on the fundamentals of criticality control and nuclear safety of interacting arrays of fissile materials. Experimental critical parameters are included for systems containing ^{233}U, ^{235}U, and ^{239}Pu with and without moderators. Methods are given for calculating the critical mass of homogeneous reactors of complex geometry. The effects of neutron absorbers on critical systems are studied considering the efficiency of central rods in a cylindrical assembly, interference of various rods, arrangement of rods, and the use of special neutron absorbers. Criticality calculations are presented for interacting subcritical assemblies using various calculational methods. Uncontrolled chain reaction bursts in fissile systems, causes of criticality accidents, engineering considerations, and safety guides for handling and shipment of fissile materials are discussed. (H.D.R.)

47003 DETERMINATION OF THE NEUTRON SPECTRUM IN A THERMAL REACTOR BY A FLUX SYNTHESIS METHOD. Hembd, H. (CCR EURATOM, Ispra, Italy). 13p. (CONF-660204-21). ORAU. Gmelin, AED-CONF-66-017-15.

From American Nuclear Society Meeting, San Diego, Calif.

The thermal neutron flux in a reactor is approximated by a linear superposition of energy distributions weighted by spatial amplitudes. Either the set of the energy components or the set of the spatial components may be prescribed. The unknown set is then determined by a variational method. This procedure may be repeated successively in both directions to give the best possible approximation compatible with the superposition ansatz. The problem is treated in diffusion approximation in two space dimensions. For simplicity the energy exchange is described by the (generalized) heavy gas operator. A FORTRAN II/3-program TFS (Thermal Flux Synthesis) for the IBM 7090-computer has been written to solve the equations produced by the variational process. (auth)

Fuels

Refer also to abstract 46177.

47004 (BMI-X-10172) DEVELOPMENT OF FABRICATION PROCEDURES FOR THE AARR FUEL PLATES. Lozier, D. E.; Kizer, D. E. (Battelle Memorial Inst., Columbus, Ohio). July 12, 1966. Contract W-7405-eng-92. 24p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

UO_2 particles prepared by various methods and with different additives and degrees of purity were characterized on the basis of density measurements, particle structure and shape, crushing strength, and chemical analyses. A standard AARR fuel plate containing stainless steel–37 wt % UO_2 was fabricated with each type of UO_2 for the purpose of evaluating the UO_2. The two criteria used for evaluating the UO_2 were overall structure of the rolled dispersion and retained porosity in the UO_2 after rolling. On the basis of the results obtained, specifications for the purchase of UO_2 are recommended. (A.G.W.)

47005 (CONF-661001-7) THERMAL CALCULATIONS FOR CYLINDRICAL FUEL RODS BASED ON THE ROBERTSON CONCEPT. Anderson, W. Kermit; Mueller, Gerhard O. (Knolls Atomic Power Lab., Schenectady, N. Y.). Nov. 1966. Contract W-31-109-eng-52. 23p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 14th Conference on Remote Systems Technology, Pittsburgh, Pa.

The KER-4 computer program is described. This program is used when performing parameter studies on cylindrical and tubular reactor fuel elements. Given a set of input conditions such as porosity, thermal conductivity, heat generation, physical dimensions, and boundary temperatures, the KER-4 program will calculate the temperature distribution in the fuel element. The computation carried out by KER-4 in terms of the necessary mathematical derivations, information on programming, and an example of results of a multi-parameter study of a fuel rod design are presented. (auth)

47006 (EURAEC–1666) USE OF PLUTONIUM AS A FUEL IN NUCLEAR REACTORS. Quarterly Report No. 9, January 1–March 31, 1966. (Societe Belge pour l'Industrie Nucleaire, Brussels). May 1966. Contract 001-64-1TRUB. 74p. (BN–6605-02; EUR–2858). Dep. mn, CFSTI $3.00 cy, $0.75 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

Research was centered chiefly around detailed study of Pu recycling in the SENA power plant. The homogeneous ceramic oxide fuels required for the program will be prepared by fusion. Various parameters for this process were examined, and their values were determined by a series of tests on UO_2. The conditions for welding the fuel rod plugs to thin clads were defined. Tests in which the vibration conditions were varied seem to show that heterogeneities in the Pu distribution may be affected by sweeping the resonance frequencies during filling. Densities of 90% TD were obtained in BR-3 type tubes by pneumatic vibration, whereas electrodynamic vibration gives a density of around 87% for the same tubes. A method for analyzing Cl_2, based on the analytical method for determining traces of Cl_2, was developed, since the standard method for Cl_2 analysis in UO_2 cannot be applied to samples containing PuO_2. A detailed study of the incidence of transversal defects, on nondestructive determination by counting the 384 kev line was made on SENA rods. Although their diameter is very different from that of the BR-3/Vulcain rods, the conclusions indicate that here too the nondestructive control method reveals heterogeneities in the Pu distribution. Analysis of the results obtained from the second series of irradiation tests in the Br-2 hydraulic conveyor was continued. The maximum power generated was evaluated at about 600 w/cm. On the basis of the metallographic sections, it can be stated that no important structural alteration occurred in the fuel, except perhaps for slight sintering of the grains. A third series was undertaken with a maximum value of $1\frac{1}{2}$ times the value obtained during previous irradiations. The chief aim of the neutron program is the determination of the nuclear characteristics of the UO_2–PuO_2–H_2O lattices, with a view to initiating the study of the recycling of Pu-enriched fuels in light water power reactors. Theoretical work comprises improvement of the set of formulas, adaptation of existing codes, and method calibration. Experimental work includes fundamental experiments on pulsed subcritical lattices and critical subassemblies, as well as experiments simulating recycling configurations in the SENA reactor. The study of thermalization in a heterogeneous medium continued, and was concerned chiefly with a calculation method for determining the thermal spectrum in a heterogeneous UO_2–PuO_2–H_2O cell. Various thermalization models were considered. Adaptation for an IBM 360 of the codes currently used with the IBM 1620 computor was continued. The study of the lattices made up of fuel elements from the Thetis reactor was completed by a set of reactive effect measurements and the determination of decay constant alpha using the correlation method. The experimental program of subcritical approximations which will use the VENUS/Vulcain fuel was clarified. The adaptation of the VENUS critical plant for the experimental program was considered. Preliminary designs were prepared and execution was started. The main parameters to be considered when examining the incidence of Pu recycling on fuel economy in the SENA reactor were defined. A basic concept was adopted to allow work to start, and a number of variants were selected. (auth)

47007 PLUTONIUM RECYCLING: CONSEQUENCES FOR URANIUM. Stoller, Sidney M. (S. M. Stoller Associates, New York). pp 38-43 of Proceedings of the 1965 Conference, Atomic Industrial Forum, Inc., Washington, D. C. McCluskey, Robert J. (ed.). New York, Atomic Industrial Forum, 1966.

The background and current status of plutonium recycling is reviewed. The fabrication of plutonium-bearing fuel elements is considered. Projections of annual uranium production requirements, assuming different dates for the coming into use of breeder reactors are presented. (M.C.G.)

47008 FUTURE FUEL CYCLES FOR HEAVY WATER MODERATED REACTORS. Fortune, R. F.; Penn, W. J. (Canadian General Electric Co., Ltd., Peterborough, Ont.). 27p. (CONF-660516–5). ORAU. Gmelin, AED-CONF-66-138-5.

From Annual Conference on Organic and Heavy Water Reactors, Winnipeg, Canada.

The economics of using various fuels in a reference 300 Mw(e) heavy water moderated reactor are examined. Projected fuel cycle costs are presented for natural U, Pu enriched U, and Th enriched with ^{235}U. (H.D.R.)

47009 USE OF THORIUM IN PRESSURIZED HEAVY WATER REACTORS. Almgren, B. (Aktiebolaget Atomenergi, Stockholm). 24p. (CONF-660524–11). ORAU. AED-CONF-66-104-11.

From 2nd International Thorium Fuel Cycle Symposium, Gatlinburg, Tenn.

The potential of Th–^{233}U fuel cycles in pressurized heavy water reactors is investigated. A computer program CAROL was developed for point reactivity burnup calculations and some of the burnup and breeding ratio calculations are presented. Preliminary fuel cost estimates and effects of various distributions of fuel in the core are examined. (H.D.R.)

47010 PREPARATION AND EVALUATION OF NON-OXIDE THORIUM-BASE FUELS. Farkas, M. S. (Battelle Memorial Inst., Columbus, Ohio). 25p. (CONF-660524–8). ORAU. Gmelin, AED-CONF-66-104-9.

From 2nd International Thorium Fuel Cycle Symposium, Gatlinburg, Tenn.

A study of cast Th and Th–U compounds as potential high-temperature breeder fuels or blanket materials indicated that the most promising materials were the beryllides, monocarbides, and dicarbides. The compounds $ThBe_{13}$, (90Th-10U)Be_{13}, (80Th–20U)Be_{13}, ThC, (90Th–10U)C, (80Th–20U)C, ThC_2, (90Th–10U)C_2, and (80Th–20U)C_2 were prepared by arc casting techniques. Data on the microstructures, oxidation behavior, corrosion behavior, thermal conductivity, thermal expansion, hardness, compressive fracture strength, and compatibility with potential cladding materials are presented. (A.G.W.)

47011 VITREOUS MATERIALS AND THEIR APPLICATION TO NUCLEAR REACTORS. Pons, Andre H. (to Compagnie de Saint-Gobain, Paris). Canadian Patent 740,804. Aug. 16, 1966. Priority date Dec. 30, 1958, France).

For homogeneous reactors one type of fuel consists of spherical glass beads up to 100 μ in dia containing U and Th. To avoid excessive absorption of neutrons, no elements of large cross section may be used in the beads. TiO_2 and ZrO_2 incorporated into the glass aids vitrification and renders attack by heavy water up to 300°C negligible. Treatment with Be and Mg silicates as a surface layer confers additional resistance to attack. Composition of the eight oxides in the glass as well as optimum concentration of special treatment solutions are given. (F.S.A.)

47012 NUCLEAR FUEL ELEMENT. Boudouresques, Bernard (to Commissariat a l'Energie Atomique). Canadian Patent 740,525. Aug. 9, 1966. Priority date Aug. 20, 1962, France.

The fissile or fertile material is surrounded by a sheath, which is in turn disposed in a jacket consisting of material having a low neutron absorption coefficient. Such fuels are intended for use in a gas cooled graphite-moderated reactor, though liquid moderated operation is possible also. The sheath of each cartridge comprises longitudinal centering partitions extruded integrally with the sheath with the lateral edge of the partitions recessed in toothed form. The inner wall of the outer jacket is formed with continuous helical grooves so as to enable the cartridge to be screwed into the interior of the jacket. The sheath is thus held completely fast on the rod, while, in addition, the effect of the slipping of the sheath on the rod is avoided. It is claimed that this arrangement avoids difficulties due to differential expansion of the fuel and the graphite jacket. (F.S.A.)

Power and Power-Breeder Reactors

47013 (DP–1007) A COMPUTER PROGRAM FOR THE OPTIMIZATION OF ORGANIC-COOLED D_2O REACTORS. Wade, James W. (Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.). Apr. 1966. Contract AT(07-2)-1. 219p. Dep. mn. CFSTI $6.00 cy, $1.25 mn.

The portion of the Cost Optimization Program, COP, that is used to design and calculate costs for organic-cooled, heavy-water-moderated power reactor plants is coded in FORTRAN II for an IBM 704 computer. The code is applicable for power reactor plants with electrical outputs of 300, 500, or 1000 Mw(e). The main features of the code include: an automatic design of concentric fuel tubes of either UO_2 or UC including the calculation of the operating conditions of the fuel assembly and a determination of the reactivity parameters for a unit cell; the determination of the number of fuel positions and an estimate of the fuel life for several fuel charging strategies; an evaluation of the fuel fabrication costs for the specific fuel assembly design and reactor throughput; the design and cost determination for the major reactor equipment, the building structures, and the reactor auxiliary facilities; an automatic optimization of the turbine plant conditions and of the steam generator design; and a final editing of the reactor plant conditions, and the capital, fuel, and operating components of the total electrical power costs. (auth)

47014 (NAA-SR-Memo–8324) PRESSURE BUILDUP IN THE CELL AND PRIMARY VAULT OF THE FARET FROM SODIUM FIRES OR SPILLS. Rumpf, N. K. (Atomics International, Canoga Park, Calif.). Mar. 18, 1963. Contract AT(11-1)-Gen-8. 14p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

Two different types of fires are analyzed which might result from the explosion of a supercritical mass in the core with the equivalent force of 300 lb TNT. If a fine Na spray is expelled into an atmosphere of air, a pressure of 48 psig is possible. However, this accident is found to be incredible in the present physical surroundings. There is a remote possibility that the top shield plug could become dislodged by an explosion. In such an instance it is found that the pressure after 3 hours is 4.22 psig and the maximum possible pressure is 10 psig. This is well within the 30 psig design pressure. The primary vault, which has the largest floor area to over-all surface area ratio, is analyzed. The initial pressure increase for a spill of 1000 lb or more is such that gas must be removed at 1668 cfm. A relief valve has already been designed into the system. It is found that this valve must be in a 4 inch line in order to keep the pressure in the vault at less than 2 psig which is within the design limits. (auth)

47015 (ORNL-P–2397) OPERATION OF THE MOLTEN SALT REACTOR EXPERIMENT. Haubenreich, Paul N. (Oak Ridge National Lab., Tenn.). [1965]. Contract W-7405-eng-26. 11p. (CONF-660524–18). Dep. mn. CFSTI $1.00 cy, $0.50 mn.

From 2nd International Thorium Fuel Cycle Symposium, Gatlinburg, Tenn.

A description of the experience with the ORNL Molten Salt Reactor Experiment is presented. The summary includes a description of the MSRE, nuclear characteristics, corrosion, fuel stability, and equipment performance and reliability. (B.G.D.)

47016 (WAPD-PWR–2220) PWR CORE 2 MOTOR-OPERATED VALVE LOOP FILTERS. Instruction Book. (Cuno Engineering Corp., Meriden, Conn. Tech-Space Div.). Oct. 31, 1963. Contract AT(11-1)-Gen-14. 30p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

For Westinghouse Electric Corp., Atomic Power Div., Pittsburgh, Pa.

The instruction manual includes general information, operation, installation and removal, adjustments and tests, maintenance, parts list, drawings, and procedure for installing valve body closures. (B.G.D.)

47017 (WCAP–3385-8) SAXTON PLUTONIUM PROGRAM. Semiannual Progress Report for the Period Ending June 30, 1966. (Westinghouse Electric Corp., Pittsburgh, Pa. Atomic Power Div.). July 1966. Contract AT(30-1)-3385. 48p. (EURAEC–1661). Dep. mn. CFSTI $2.00 cy, $0.50 mn.

Work Performed under United States–Euratom Joint Research and Development Program.

The startup experimental program was completed during the period. For most of the period the core operated at full rated power. The core has achieved roughly half of the design burnup and there is sufficient reactivity left in the core to significantly exceed the burnup objectives. Close agreement between the measured and calculated reactivities has been demonstrated for control rod and B worth, and for critical B concentration requirements. Core depletion, using the LEOPARD V–BUBBLE–PDQ calculation procedure, is in good agreement with that observed. While beginning-of-life power distribution characteristics of the core confirm the initial predictions, the expected reduction in peak rod power with irradiation has not been observed. Also, the power coefficient was more negative than was calculated. This difference is due in part to design changes which are now being evaluated. No difficulties were encountered in operation with the PuO_2–UO_2 fuel. By the end of June, the average burnup in the Pu region was about 6170 Mwd/mtm* (metric ton metal), the average in the hot rod was about 9160 Mwd/mtm and in the peak pellet was about 12,400 Mwd/mtm. (auth)

47018 (ORNL-tr–1282) THE PRESTRESSED CONCRETE VESSELS OF THE G2, G3 REACTORS. Conte, F. (Commissariat a l'Energie Atomique, Chusclan (France). Centre de Production de Plutonium de Marcoule). Translated by Gregory L. Boisvert (Oak Ridge National Lab., Tenn.), from report. 15p. Dep. mn. JCL $1.60 fs, $0.80 mf.

A discussion is presented on the prestressed concrete vessels of the G2 and G3 power breeder reactors at Marcoule. Topics included are a brief description of the reactors, description of the reactor vessels, construction, scale models, testing of reactor vessels, general behavior, and operational supervision. (B.G.D.)

47019 (ORNL-tr–1284) THE PRESTRESSED CONCRETE VESSELS. The G2-G3 Reactors Operational Tests. Translated by Gregory L. Boisvert (Oak Ridge National Lab., Tenn.). 15p. Dep. mn. JCL $1.60 fs, $0.80 mf.

The experience from 1963 to 1966 on the force-measuring support blocks for monitoring the tension in the prestressing cables, is discussed. The behavior of the cables has been satisfactory except for a few girdling cables. The friction coefficient of the girdling cable system was remeasured. (D.L.C.)

47020 PRESENT STATE OF STUDIES ON THE ECONOMIC ASPECTS OF THE USE OF NUCLEAR ENERGY. Gaussens, J. (Commissariat a l'Energie Atomique, France). Atompraxis, 12: 402-5(Aug. 1966). (In French).

A survey of the economic feasibility of nuclear power plants including statistics on energy requirements, estimates of costs, and availability of raw materials is presented. The methodology used for making economic studies in this field is examined. The market for nuclear energy is growing; predictions and decisions must be based on this fact. Advances in technical efficiency and developments in manufacturing methods are considered in forecasting growth of the nuclear power industry. Also involved is the use of optimal-efficiency procedures, i.e., linear and dynamic programming, of which two examples are given. The use of mathematical techniques permits a closer analysis of the mechanism of supply and demand. (auth)

47021 ARDENNES NUCLEAR POWER PLANT AT CHOOZ. Erkes, Pierre. Belgicatom, Ass. Belge Develop. Pac. Energ. At., Bull. Inform., 11: No. 62, 33-8 (June 1966). (In French).

The characteristics of the Ardennes Nuclear Power Plant are outlined. The reactor construction, core characteristics, and the reactor economics are briefly discussed. (J.S.R.)

47022 FUEL CHARGE AT THE TOKAI POWER STATION. Ando, Tetsuya (Fuji Electric Mfg. Co., Ltd., Japan). FAPIG (Tokyo), No. 38, 177-81(Oct. 1965). (In Japanese).

An outline of the fuel charge of the Calder Hall type reactor at the Tokai Power Station was begun on April 21, 1965, and the reactor went critical on May 4. The fuel charging was done under the guidance of Japan Atomic Power Company and BGECJ. The fuel charge is discussed under the following chapter headings: introduction; fuel; path of fuel in its charge into the reactor and auxiliary facilities; charge of temperature-measuring fuel; order in charging fuel; process of fuel charge; radiation control, clarity control; and conclusion. The fuel of this reactor is natural uranium, clad with Magnox and having graphite sleeves, and it was charged into the reactor radially from the center outward. The path of fuel was roughly as follows: fuel storage → charge face (about 30 m high) → fuel inspection → pile cap → loading teams → in standpipes → fuel channels in the pressure vessel. One fuel rod could be loaded by one team, in 4 minutes. With four teams working the fuel was loaded at a rate of one rad/min. (NSA of Japan)

47023 DRESDEN–GARIGLIANO–GUNDREMMINGEN. Ing. Nucl., 7: 12-29(Jan.-Feb. 1966). (In Italian).

The history of the development of boiling water reactors is traced from the first studies to the first large installations in the United States and in Europe. The most important technical problems encountered in the design phase and the solutions adopted to resolve them are discussed and compared for the Dresden, Garigliano, and Gundremmingen nuclear power plants. (J.S.R.)

47024 THE PROSPECTS FOR NUCLEAR REACTOR-MHD COMMERCIAL POWER PRODUCTION. Booth, L. A. (Los Alamos Scientific Lab., N. Mex.). J. Eng. Power, 88: 345-54(1966).

Cycle analysis and preliminary component designs were made for prospective nuclear reactor-MHD commercial power plants, and the problems associated with component development discussed. The concept of commercial MHD power production was compared with other nuclear reactor power plants, and recommendations made as to the feasibility of the MHD concept. The results of the study, conducted by an ad hoc committee of staff members at the Los Alamos Scientific Laboratory, indicate that nuclear reactor-MHD power production is not feasible for the foreseeable future. The development of major components for MHD plants would require extensive programs, and this cannot be justified in view of the presently undefined criteria. Moreover, no significant gains in power economy can be predicted that will allow the nuclear-MHD plant to compete with more conventional nuclear power plants. (auth)

47025 POTASSIUM-STEAM BINARY VAPOR CYCLE FOR A MOLTEN-SALT REACTOR POWER PLANT. Fraas, A. P. (Oak Ridge National Lab., Tenn.). J. Eng. Power, 88: 355-66(Oct. 1966).

A conceptual design for one embodiment of a binary vapor cycle coupled to a molten-salt reactor was prepared to determine whether such a plant is sufficiently attractive to warrant further investigation. Its overall thermal efficiency was estimated to be 54 percent, while its heat rejection to the condensers is about half of that for a modern steam plant. The quantities of material required for the heat exchangers and piping for both a coal-fired supercritical-pressure steam plant and a nuclear-powered potassium vapor and supercritical-steam plant were estimated and compared along with the associated costs. The resulting cost and performance data indicate that the nuclear plant with a potassium-vapor and steam binary cycle may give both lower capital charges and a much higher overall efficiency than a coal-fired supercritical-pressure steam plant. (auth)

47026 RADIATION CONTROL AT THE TOKAI POWER STATION OF JAPAN ATOMIC POWER COMPANY. Yuhara, Hiroshi (Japan Atomic Power Co.). Karyoku Hatsuden, 17: 66-9(Jan. 1966). (In Japanese).

Radiation control during normal operation and at the time of accidents at the Tokai power station is discussed. Topics included are: the effects of radioactive gases, consisting mainly of radioactive cooling air for the shields released from a 65-m high stack after filtration and leaking CO_2 gas, released on the surrounding populace; effects of released radioactive drainage, including water from spent-fuel storage ponds and drainage from decontamination works, on the surrounding areas; effects on the surrounding areas of radioactive substances released at the time of accidents; and radiation monitoring for the site and surrounding areas. The worst possible accident considered is damage to the main CO_2 piping, when radioactive iodine is released. (NSA of Japan)

47027 NUCLEAR POWER IN THE UNITED KINGDOM. Stewart, J. C. C.; Neue Tech., 8: 169-75(1966).

The power reactor development programs of the United Kingdom are reviewed. Basic design, development, and economics are discussed for the gas-cooled Magnox and AGR concepts. Essential features of the Steam-Generating Heavy-Water Reactor are described, and the research on fast-breeder reactors is summarized. Fuel supply and reprocessing services of the UKAEA are outlined. (H.D.R.)

47028 PROBLEMS IN THE PREPARATION AND APPLICATION OF GRAPHITE. Schiel, L. (Gebrueder Sulzer AG, Winterthur, Ger.). Neue Tech., 8: 198-203 (1966). (In German).

The problems which have presented themselves in the application of graphite for the first Lucens fuel element charge are briefly described. These mainly concern the machining, the differential thermal expansions, the change in dimensions on irradiation, the thermal stresses, the mechanical stresses, and the gas permeability. (auth)

47029 BURNUP CHARACTERISTICS OF D_2O MODERATED Pu FUELED LATTICE. I. USING Pu DIRECTLY AND IN THE SELF-SUSTAINING. Shindo, Ryuiti; Yasukawa, Sigeru; Yamamoto, Yoshio (Japan Atomic Energy Research Inst., Tokyo). Nippon Genshiryoku Gakkaishi, 8: 354-60(July 1966). (In Japanese).

The burnup analysis of a D_2O-moderated lattice, fueled with Pu is reported. There are a number of different ways in which Pu can be used as fuel, and Pu efficiency depends thereon. Analyses for the cases of direct use of Pu and of the self-sustaining cycle. In the former case, it is established that the nuclear value of Pu is not inferior to that of ^{235}U and in the latter case, it is shown that Pu mixed with natural U will permit ^{235}U in the natural U to be effectively burned without much consumption of the Pu. (auth)

47030 STABILITY OF RANDOMLY PACKED BEDS OF FUEL SPHERES. Parsick, R. J.; Jones, S. C.; Hatch, L. P. (Brookhaven National Lab., Upton, N. Y.). Nucl. Appl., 2: 221-5(June 1966). (BNL-9501).

The Settled Bed Fast Reactor (SBFR) concept features a packed bed of fuel (directly cooled with sodium) which must be highly resistant to consolidation during power operation in order to avoid reactivity excursions resulting from sudden increases in bed solid fraction. In the SBFR design, the stability of the packed fuel bed is considered acceptable if a 12-g lateral shock produces a change in bed solid fraction of less than 0.002 (e.g., from 0.630 to 0.632), equivalent to a 10¢ reactivity change. Experimental results show that beds settled from fluidization can be compacted to exhibit $\frac{1}{6}$ of this change when shock tested. The particle interlocking effect of simulated coolant downflow gives a substantial extra measure of stability. (auth)

47031 AUTOMATIC FLOW BALANCING DEVICE FOR BOILING WATER REACTORS. Gall, D. A.; Doyle, E. F.; Bourne, J. G. (Dynatech Corp., Cambridge, Mass.). Nucl. Appl., 2: 226-30(June 1966).

A prototype device to control the exit steam quality in the individual fuel element assemblies of a boiling water reactor was designed, constructed and tested at simulated reactor operating conditions. The device consists of two venturis and a mechanism for comparing the pressure signals from the venturis and controlling the flow by means of a hydraulically operated valve. The device, which is completely self-contained within one channel of a boiling water reactor, held the discharge volume quality to ±6% of the design value during transients in the heat transfer rate of up to 25%. The addition of the device to the high heat flux channels of a boiling water reactor would permit designing reactors at a higher heat flux for the same departure from nucleate boiling. The pressure across the core (header to header) is increased by ≈20% for a reactor of the Dresden type. Overall economic effects on reactor operations, including reactivity effects, were not evaluated. (auth)

47032 PROTOTYPE MACHINE FOR HANDLING FUEL. Di Chirico, G.; Merli, E. (Comitato Nazionale Energia Nucleare, Rome). Nucl. Appl., 2: 231-6(June 1966).

The machine for handling the fuel and control rods of the Prototipo Reattore Organico organic-moderated and -cooled reactor is rugged and simple. It utilizes a pantograph in the vertical plane which pivots about one of its vertical members. Tests on a prototype established the reliability of operation and reproducibility of positioning and suggested minor improvements. (auth)

47033 FAST REACTOR MELTDOWN PROGRAM. Dickerman, C. E. (Argonne National Lab., Ill.). Nucl. Safety, 7: 424-35(Summer 1966).

The status of research on the core meltdown problems and their relation to other areas of safety research for fast reactors are reviewed briefly. The experimental meltdown program is described, and a summary is presented of the experimental facilities, apparatus, instrumentation, associated theoretical techniques, and meltdown data obtained thus far. Use of the data in accident analyses is illustrated, and the scope of the problems remaining to be studied is indicated. (auth)

47034 BURNOUT IN BOILING HEAT TRANSFER. Gambill, W. R. Nucl. Safety, 7: 436-43(Summer 1966).

Selected recent developments regarding boiling burnout (or boiling crisis or departure from nucleate boiling) are reviewed. For pool systems, results are summarized for mixtures and boric acid solutions, liquid metals (Na, K, Rb, and Mg), cryogens (N_2, O_2, and H_2), boiling on fins, boiling under vacuum conditions, and boiling in blocked vertical channels; and reference is made to experimental boiling detection studies. For subcooled forced-convection systems, general burnout studies with water and ethanol are treated, as are investigations relevant to specific reactors (Savannah River, SM-2, ATR, and CVTR). (auth)

47035 FURTHER USE OF ON-LINE DIGITAL COMPUTERS IN THE OPERATION OF POWER REACTORS. Lawrence, B. R.; Epler, E. P. Nucl. Safety, 7: 456-8 (Summer 1966).

There is increasing incentive to utilize the unique features of the digital computer for control purposes in the operation of a power reactor. A few areas other than data acquisition, data logging, and checking are discussed in which it is generally believed that on-line digital computers might be used to overcome some of the difficulties and limitations experienced with existing instrumentation and control systems. Areas discussed include optimum control, detection of reactivity anomalies, and control of spatial power distribution. (auth)

47036 ELK RIVER REACTOR OPERATING EXPERIENCE. Campbell, R. J.; Hall, D.; Kettner, D. (Rural Cooperative Power Association, Elk River, Minn.). Nucl. Safety, 7: 482-95(Summer 1966).

The Elk River Reactor (ERR) is a 58-Mw(t) indirect-cycle natural-circulation boiling-water reactor. The facility is operated by the Rural Cooperative Power Association (RCPA) of Elk River, Minn., for the Atomic Energy Commission in conjuction with RCPA's 45-Mw fossil-fueled generating plant at the same site. Since the ERR facility went into commercial operation on July 13, 1964, it has generated over 230,000,000 kw-hr of electricity with an overall availability of 71%. The overall operation of the ERR has been good. This is especially true of plant operability, radiation levels, and personnel exposure. There have been a number of minor design problems, but for the most part they have been corrected. The more significant design and operating problems concern two instances of primary-to-secondary system leakage, primary system hydraulic oscillations, spurious scrams caused by instrumentation failures, changes in some of the materials used in the control rods and control-rod drives, and the need to replace three control rods when inspections revealed cracks. The plant was shut down for inspection of certain core internals and a partial refueling in April 1966. It was returned to operation in July 1966 and should continue to demonstrate the high reliability shown by recent operating experience. (auth)

47037 ACTION ON REACTOR PROJECTS UNDERGOING REGULATORY REVIEW. Blakely, J. P. Nucl. Safety, 7: 513-21(Summer 1966).

The Atomic Energy Act requires AEC to protect the health and safety of the public from exposure to radiation hazards, and the Commission has developed regulations to ensure that this responsibility is fulfilled. Such regulations are contained in Title 10, Code of Federal Regulations. Under the Act and Regulations, certain safety findings must be made by the Commission before either a construction permit or an operating license for a facility can be issued. These findings are made only after a careful technical review by the regulatory staff and, in the more significant instances, by the Advisory Committee on Reactor Safeguards (ACRS). In addition, no amendment to an operating license or "change" in the technical specifications to an operating license can be made without a safety evaluation by the regulatory staff and, in some instances, a review by the ACRS. The license-application records of various power reactors are reported in Table 1. Several AEC and experimental reactors are also listed in this table and discussed in the following text because of general interest in the safety characteristics of such reactors and because of the bearing their safety experience may have on future reactors. Recent regulatory actions relating to certain reactors are summarized. Some information is also included on difficulties or unusual occurrences that were reported to the AEC. (auth)

47038 NUCLEAR DESALINATION ABROAD: THE ISRAEL PROJECT. Bush, Philip D. (Kaiser Engineers, Oakland, Calif.). pp 148-62 of Proceedings of the 1965 Conference, Atomic Industrial Forum, Inc., Washington, D. C. McCluskey, Robert J. (ed.). New York, Atomic Industrial Forum, 1966.

The reference design selected in a joint United States-Israel study of a dual-purpose power-desalination plant is described. The plant complex consists of a light water reactor, a back pressure turbine, and a multi-stage flash evaporator with capacities of 200 Mw(e) and 100 million gallons of water per day. Engineering and economic aspects of the plant are discussed and a proposed development schedule is presented. (H.D.R.)

47039 LOOPS FOR HEAT AND FLOW TESTS AND TECHNOLOGICAL TRIALS IN THE DEVELOPMENT OF POWER REACTORS. Kahlert, Wolfgang (Siemens-Schuckert Research Center, Erlangen, Ger.). Siemens Rev., 33: 184-91(Mar. 1966).

Tests of thermal, flow engineering, and technological problems in connection with the design and the construction of heavy water-moderated reactors are described, especially the multi-purpose reactor (MZFR) and the pressure-tube reactor for the nuclear power plant in Niederaichbach (KKN, formerly AKB project). Additionally, a large-scale test program was conducted for the pressurized water reactor in Obrigheim (KWO). The test runs were made in pipe loops in which the medium that determines the character of the system is circulated under adjustable thermal conditions. According to the requirements, the loops consist of the following: feed systems, pressurizers, heaters, coolers, filters, cleaning loops, and control and measuring systems for operating purposes and for the test itself. A description is given of the function, characteristics, and properties of each test loop. The technical data are given in tables. Measurements were made of the heat transfer and pressure losses at the high velocities of forced convection in tubes after surface boiling had started. In addition to heat transfer experiments in the high pressure region, the test loop was also used to heat secondary test loops. For example, the stability of a water film was investigated which was employed for cooling the outside of a heated pipe. Sodium and aerodynamic test loops are also described, as well as measurements made with them. (BBB)

47040 GAS COOLED NUCLEAR REACTOR WITH MEANS FOR WITHDRAWING VOLATILE FISSION PRODUCTS. German Patent 1,216,445. May 12, 1966. Filed Dec. 8, 1961.

A gas cooled nuclear reactor is described which has a core containing a number of separate flow paths for gas, ducts communicating said flow paths with a flow restricting orifice and means in the ducts for separating solid particles from the gas upstream of the orifice. The flow restricting orifice is arranged to form the outlet of a cyclone separating chamber. Means are provided for leading off a sample of the gas in flow path from a region of the flow path adjacent to the orifice. The reactor has a number of fuel components, each component having a mounting member and means providing a purge gas flow path through each component and its mounting to allow gas to purge the component of fission products during operation of the reactor, the gaseous content being passed through a flow restricting orifice. (auth)

47041 REACTOR CORE AND SUPPORT THEREFOR. Huntington, Morgan G. (to RNB Corp.). U. S. Patent 3,264,191. Aug. 2, 1966. Filed Aug. 20, 1964.

A graphite moderator assembly for a light water heterogeneous power reactor is described. The core assembly consists of stacked graphite blocks with fuel and coolant penetrations parallel to two of three supported sides. The supporting sides ensure that the alignment of the penetrations will not be disrupted during thermal expansion and contraction of the core. Since the assembly may be tilted as much as 40° from its original vertical axis without changing the alignment of the penetrations, the reactor core is considered an earthquake-resistant structure. (H.D.R.)

47042 NUCLEAR REACTOR POWER STATIONS. Thorn, James Douglas (to United Kingdom Atomic Energy Authority). British Patent 1,038,419. Aug. 10, 1966. Filed Aug. 27, 1964.

A nuclear power station design is presented using a steam-powered system for circulating gas coolant. The steam is received at intermediate pressure from a reheat line and exhausted to a desalination plant. (H.D.R.)

47043 FUEL CYCLES IN THE UNITED KINGDOM POWER PROGRAM. Hill, J. M. (United Kingdom Atomic Energy Authority, Risley, Eng.). 8p. (CONF-178-8). ORAU.

From European Atomic Energy Society's Symposium on Fuel Cycles for Power Reactors, Baden-Baden, Ger., Sept. 1963.

A descriptive summary is presented of the U.K. power program and the facilities for U production, fuel fabrication, and fuel enrichment and reprocessing involved for natural-U graphite-moderated reactors already under construction and for enriched thermal reactors and fast reactors of the future. (auth)

47044 CONTROL AND INSTRUMENTATION OF MAJOR NUCLEAR POWER REACTORS. BIBLIOGRAPHY. New York, Inst. of Electrical and Electronics Engineers, 1966, Paper No. 31PP66-493, 8p. (CONF-660708-7). ORAU.

From IEEE Summer Power Meeting, New Orleans.

Titles of 91 references are included on the control and instrumentation of the Shippingport, Calder Hall, Dounreay, Dresden, Hallam, Yankee, Indian Point, Peach Bottom, Piqua, Fermi, and NPD reactors. (H.D.R.)

47045 ELECTRICAL ASPECTS OF A LARGE DUAL-PURPOSE NUCLEAR POWER AND DESALTING PLANT. Zweigler, R. (Bechtel Corp., Los Angeles). New York, Inst. of Electrical and Electronics Engineers, 1966, Paper No. 31PP66-523, 27p. (CONF-660708-8). ORAU.

From IEEE Summer Power Meeting, New Orleans.

The electric power system engineering considerations involved in developing a 1790 Mw(e) nuclear-generating and 150 mgd seawater desalting plant in Southern California are discussed. The plant process, siting, and power and water production and costs are examined for a man-made island off the coast. Auxiliary power systems for the power and desalting plant and product water pumping are considered, and electric power transmission methods from the island are evaluated. (H.D.R.)

47046 CANDU-BLW-250 PROGRESS REPORT. Pon, G. A. 14p. (CONF-660516-6). ORAU. Gmelin, AED-CONF-66-138-2.

From Annual Conference on Organic and Heavy Water Reactors, Winnipeg, Can.

The general design features are described for a 250 Mw(e) prototype of a boiling light water cooled, heavy water moderated natural uranium reactor. (H.D.R.)

47047 FAST BREEDER REACTORS WITH MIXED FUEL CYCLES. Allen, W. O.; Stoker, D. J.; Campise, A. V. (Atomics International, Canoga Park, Calif.). 18p. (CONF-660524-16). ORAU. Gmelin, AED-CONF-66-104-14.

From 2nd International Thorium Fuel Cycle Symposium, Gatlinburg, Tenn.

Design parameters are presented for a 1,000 Mw(e) Na-cooled fast breeder reactor utilizing oxide fuels and hybrid or mixed fuel cycles. Survey calculations are given for each fuel combination, and reactor kinetics, parameters are analyzed for each core. Three different mixed fuel combinations are studied in the two-zone core configuration. Detailed fuel cycle economics data are presented for both a 1,000 Mw(e) and a 500 Mw(e) version of a core with a center zone of ^{233}U and ^{238}U and an outer zone of ^{239}Pu and ^{238}U. (H.D.R.)

47048 STUDY OF 150 MGD DESALTED WATER-POWER DUAL PLANT FOR SOUTHERN CALIFORNIA. Currier, Edwin L. (Bechtel Corp., San Francisco); Holtom, H. T. 22p. (CONF-660546-1). ORAU. Gmelin, AED-CONF-66-111-2.

From American Society of Civil Engineers, Water Resources Engineering Conference, Denver, Colo.

The findings of a study on the engineering and economic feasibility of a 150 million gallon per day dual-purpose desalination plant for Southern California are presented. The power plant size, the cases studied, the conceptual plant description, site selection, and cost are discussed. An optimum plant design employs either a boiling or pressurized light water reactor producing 1,629 Mw(e) and furnishing steam to a 150 mgd multistage flash evaporator plant. (H.D.R.)

47049 ECONOMICS OF INTEGRATED OPERATION OF NUCLEAR AND CONVENTIONAL PLANTS. Houser, H. G.; Nordman, D. A. (Westinghouse Electric Corp., East Pittsburgh, Pa.). 17p. (CONF-660708-1). ORAU.

From Institute of Electrical and Electronics Engineers, Summer Meeting, New Orleans.

A greater number of different types of economically attractive generating units are now available to the electric-utility industry. Not only nuclear plants but also gas turbines and pumped-storage hydro are included. The effect that the integrated operation of these different types has on system planning is examined. In particular, systems requiring large amounts of nuclear power are considered. A simplified example of generation-system expansion applying nuclear units for base-load operation, pumped-storage units for intermediate operation, and gas-turbine units for peaking operation is shown. (auth)

47050 DOPPLER AND SODIUM VOID REACTIVITY EFFECTS IN FAST REACTORS. Greebler, P.; Pflasterer, G. R. 37p. (CONF-660204-8). ORAU. Gmelin, AED-CONF-66-017-5.

From American Nuclear Society National Topical Meeting, San Diego, Calif.

Doppler and coolant void reactivity effects on the safety of fast power reactors are considered. The physics principles underlying these reactivity coefficients are reviewed, and design features to improve the coefficients are indicated. Factors entering into their calculation are discussed, and the uncertainties of Doppler and coolant void predictions with current computation methods are reviewed. (H.D.R.)

47051 ECONOMICS OF WATER PRODUCTION USING NUCLEAR ENERGY. Milliman, J. W. (Indiana Univ., Bloomington). 38p. (CONF-660311-4). ORAU. Gmelin, AED-CONF-66-037-5.

From Symposium on Water Production Using Nuclear Energy, Tucson, Ariz.

The various technical and economic factors which affect the supply of freshwater are examined. The economic principles for the use and development of water resources and the economics of desalting are discussed. Cost considerations are examined for the choice of desalting processes, fossil versus nuclear fuels, single purpose versus dual purpose plants, and how costs are allocated between water and power in a dual purpose facility. Some of the economic aspects of the Bechtel study of a dual-purpose nuclear plant for Southern California are reviewed. (H.D.R.)

47052 STRATEGIC ECONOMIC FACTORS IN PLANNING NUCLEAR POWER FOR DESALTING SEA WATER. Mullenbach, Philip (Growth Industry Shares, Inc., Chicago). 19p. (CONF-660321-1). ORAU. Gmelin, AED-CONF-66-148-1.

From Canaveral Council of Technical Societies, 3rd Space Congress, Cocoa Beach, Fla.

The role of nuclear power in seawater desalting in the U. S. during the next decade is examined considering certain conditions relating to alternative supplies, technology and scale-up, and the specific market for water. Emphasis in the cost evaluation is placed on the development of large dual-purpose power-water desalting plants. (H.D.R.)

47053 DUAL-PURPOSE NUCLEAR POWER AND DESALTING PLANTS. Wilson, William H. (Bechtel Corp., San Francisco). 16p. (CONF-660325-1). ORAU. Gmelin, AED-CONF-66-040-2.

From Pacific Coast Electrical Assn., Annual Conference, Engineering and Operating Section, San Francisco.

An engineering and economic feasibility study of a dual-purpose nuclear plant producing 150 to 750 Mw(e) and 150 mgd of desalted water for Southern California is described. The site selection, man-made island design, comparison of fossil- and nuclear-fueled plants, power plant size selection, desalting process selection, combined plant concept, plant capital costs, and desalted water costs are summarized. (H.D.R.)

47054 DRESDEN NUCLEAR POWER STATION OPERATING EXPERIENCE. Hoyt, H. K. 7p. (CONF-660429-7). ORAU. Gmelin, AED-CONF-66-098-11.

From American Power Conference, 28th Annual Meeting, Chicago.

The operation of the Dresden reactor through the first three fuel cycles and into cycle four is reviewed. Significant forced plant outages are summarized. (H.D.R.)

47055 STATUS AND APPLICATION OF SUPERCRITICAL-WATER REACTOR COOLANT. Wright, J. H.; Patterson, J. F. (Westinghouse Electric Corp., Pittsburgh). 27p. (CONF-660429-8). ORAU. Gmelin, AED-CONF-66-098-12.

From American Power Conference, 28th Annual Meeting, Chicago.

The application of supercritical pressure water to the design of nuclear power plants is described and the technical state-of-the-art for these applications is summarized. (H.D.R.)

47056 TECHNOLOGICAL DEVELOPMENTS OF NUCLEAR SUPERHEAT. Leitz, F. J. (General Electric Co., San Jose, Calif.); Imhoff, D. H.; McEwen, L. H. 20p. (CONF-660429-9). ORAU. Gmelin, AED-CONF-66-098-15.

From American Power Conference, 28th Annual Meeting, Chicago.

Technological developments in superheat reactor reliability, fuel performance characteristics, equipment maintenance, and direct cycle system contamination and radiation levels resulting from operation of the Vallecitos Superheat Reactor are described. (H.D.R.)

Propulsion and Space

See also ENGINEERING — Space Propulsion

47057 ROLE OF CRITICAL AND SUBCRITICAL EXPERIMENTS IN THE RCN SHIP REACTOR STUDIES. Coehoorn, J. Atoomenergie Haar Toepass., 8: 129-39 (June 1966). (In Dutch).

The critical and subcritical experiments performed at the Petten Center are described. The role that the experiments have played in the ship reactor studies is shown by comparison of the measurement results with theory. (tr-auth)

47058 NUCLEAR SPACE PROGRAM: ORGANIZATION AND PLANS. Finger, Harold B. pp 163-84 of Proceedings of the 1965 Conference, Atomic Industrial Forum, Inc., Washington, D. C. McCluskey, Robert J. (ed.). New York, Atomic Industrial Forum, 1966.

The major points that define the organization under which space nuclear systems developments are being carried out are presented. Progress and planning are outlined for various propulsion and power systems, including the nuclear rocket program, nuclear electric systems, and isotope power systems. (H.D.R.)

47059 SNAP-10A FLIGHT TEST EXPERIENCE. Martin, A. B.; Dieckamp, H. M.; Wilson, R. F. (Atomics International, Canoga Park, Calif.). pp 200-9 of Proceedings of the 1965 Conference, Atomic Industrial Forum, Inc., Washington, D. C. McCluskey, Robert J. (ed.). New York, Atomic Industrial Forum, 1966.

A summary is presented of the SNAP-10A reactor SNAPSHOT flight test conducted in April 1965. The system components, ground handling, and launch support

activities are described. Startup and performance of the reactor after achieving orbit are examined and possible causes of the premature shutdown are discussed. (H.D.R.)

47060 EFFECTS OF POWER HISTORY ON THE RADIOACTIVITY INVENTORIES AND DECAY HEAT OF NUCLEAR SHIPS. Iyori, Isao (Ship Research Inst., Tokyo). Senpaku Gijutsu Kenkyujo, 2: No. 4, 25-45(Nov. 1965). (In Japanese).

An investigation is made upon the effect of power history on the transient changes in the radioactivity inventories of the reactor core, the gamma energy release rate, and the decay heat generation rate after the reactor shutdown. Results are indicated by the following: let t be the normal power operation time, and T be the subsequent time interval during which some complicated power history is experienced for arriving in and leaving from port, then the changes in the core radioactivity inventories and the radiation energy release rate through the time duration T for the case of $t > T$ are approximately the same as those for the case of $t \gg T$; if the normal operation time t is short, the radioactivity inventories and the radiation energy release rate do not always keep decreasing after the power is set to some constant, lower level; when the power is set to some upper constant level in some part of the period T, the radioactivity inventories and the energy release rate do not always approach monotonically from lowerside to the saturation value corresponding to the upper power level. They sometimes overshoot the saturation value if the normal operation time is long; there exists such a power operation process for arrival as to make the activity inventories or the radiation energy release rate minimum under the condition that the time required for the operation process is fixed. The power process can be easily calculated on an electronic computer and the above mentioned numerical calculation shows that the influences of power history appear more in the decay heat generation rate after the arrival in port than in the amount of inventories of the long-lived harmful radioactivities. (NSA of Japan)

47061 REPORT OF THE COLLISION BARRIER OF NUCLEAR-POWERED SHIPS. Akita, Yoshio (Ishikawajima-Harima Heavy Industrial Co. Ltd., Japan); Takata, Ken. Zosen Kyokai Ronbunshu, No. 118, 259-70(Dec. 1965). (In Japanese).

A series of experiments with models of bow and side construction of ships were carried out to investigate the effects of collisions at sea of nuclear powered ships. The collision barrier plays an important part in protecting the reactor plant on board. The experimental results of the collision barrier studies are summarized. It is sufficient to compare the strength of the bow construction, when it strikes a solid wall, with that of the side construction, when it is struck by a solid bow, in order to compare the strength of a bow construction with that of a side construction at the point of collision. A vessel with a raked bow is not as dangerous as a vessel with a vertical bow. The deck plate will absorb a certain amount of energy even after the shell has been penetrated. With regard to the impact loading effect, it is only necessary to correct the yielding point of the materials by the strain rate. Further studies of the effect of the entrance angle of striking vessels are necessary for the derivation of more complete formulas for calculation of the energy absorbed by collision barriers. (NSA of Japan)

Research and Test Reactors

Refer also to abstract 47004.

47062 (AERE-M-1785) SOME THERMAL-NEUTRON FLUX MEASUREMENTS IN A MOCK-UP OF A DIDO 2V FUEL-PLATE TEST RIG. McGill, I. S.; Crook, M. J. (Atomic Energy Research Establishment, Harwell (England)). Aug. 1966. 22p. Dep. BIS $0.70. HMSO 3s. 6d.

The results of thermal-flux measurements in a mockup of an H_2O-cooled fuel-plate test rig are reported. The measurements were performed in a simulated DIDO 2V position in the DAPHNE/PLUTO mockup. The results obtained show that substantial edge peaking of the thermal flux, and hence of the heat generation, is to be expected in the irradiation of small highly enriched fuel plates in the DIDO/PLUTO reactors. The suppression of the end peaking by the use of short neutron-absorbing shutters is demonstrated. The alternative procedure of framing the plate with strongly absorbing material to withdraw the end peaking beyond the edges of the fuel was not studied experimentally. The required frame thickness can however be inferred from the width of the region of flux peaking. (auth)

47063 (EUR-3057.e) THE SORA PROJECT READY FOR ITS REALISATION. Ritter, G. (European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center). 1966. 24p. Dep. mn.

A short description of the status of the art in the Research and Development Program for the fast pulsed reactor SORA is given. With the completion of the SORA-critical Experiment, all the relevant reactor parameters are now experimentally confirmed. Experimental results and theoretical predictions coincide within experimental errors. No undue risk is involved in the immediate construction of this reactor and its intended use in the field of neutron physics. (auth)

47064 (JUL-373-RB-RX) BOILING WATER FUEL ELEMENT LOOP IN FRJ-2. Neumann, M.; Reichardt, K.; Muenchow, K.; Bundesmann, G.; Dehe. P.; Lehrheuer, W. (Kernforschungsanlage, Juelich (West Germany)). Apr. 1966. 14p. (CONF-660521-3). Dep. mn.

From International Symposium on In-Pile Irradiation Equipment and Techniques, Harwell, England.

An irradiation facility, more of a capsule than a loop, was developed to test rod type fuel elements under pressurized boiling water conditions. An arrangement of small discs inside the in-pile pressure vessel maintains surface boiling conditions along the fuel rod and the nuclear heat is transported to the surrounding wall of the vessel. The heat is removed by low pressure low temperature secondary cooling water flowing over the pressure vessel through the outer tubes, enabling the two inch diameter in-pile section to be made in Al alloy thus giving very low neutron flux depression and reactivity absorption. Laboratory measurements exhibit high burnout limits and close relation between rod surface temperature and pressure. Because of the in-pile heat exchange to secondary low pressure water the out of pile equipment serves only for control and measurement and for meeting safety demands. Two loops of this type, different in design pressure, are just installed in the FRJ-2. (auth)

47065 (NAA-SR-Memo-11822) THREE-DIMENSIONAL TRANSIENT THERMAL MODEL OF A SNAP REACTOR. Magee, P. M.; Winson, R. W. (Atomics International, Canoga Park, Calif.). Feb. 10, 1966. Contract AT(11-1)-Gen-8. 47p. Dep. mn. CFSTI $2.00 cy, $0.50 mn.

A set of transfer functions and differential and algebraic equations representing the heat transfer in a single reactor fuel rod and a single coolant channel were developed. It was assumed that the fuel rod was cooled by six adjacent coolant channels and that the coolant channel was heated by three adjacent fuel rods. The effect of eccentrically locating the fuel within the cladding was included as was the temperature dependence of H_2 conductivity and fuel specific heat. Two digital subroutines were written, one simulating the fuel rod and the other the coolant channel. These subroutines were linked by a third subroutine which provides the proper geometric coupling. A technique is described that is applicable to any hexagonal array core; however, the specific reactor described is the S8ER. In order to simulate another core, it would be necessary to modify the coupling subroutine. The subroutines are fully compatible with the digital program Upstart. However, owing to the

extreme complexity and detail of the thermal model, it is recommended that the system not be operated as a closed loop. Rather, the core model should be used to obtain transient and steady state thermal response to programmed reactor power, coolant flow, and coolant inlet temperature as functions of time. (auth)

47066 JAERI NEUTRON VELOCITY SELECTOR. Hirata, Jippo (Japan Atomic Energy Research Inst., Tokyo); Hamada, H. Meidensha Jiho, No. 63, 2-9(Aug. 1965). (In Japanese).

The neutron velocity selector for use in reactor physics studies was designed, constructed, and installed on the JRR-3 reactor at Tokai Research Establishment and it is now in satisfactory operation. The apparatus was designed to give the maximum resolution of 2% for the neutron energy range of 10^{-3} to 10^{2} ev, as the result of the pre-design investigation with two rotors. Therefore, it has a maximum rotation of 18,000 rpm (236 m of circumference/sec) for the rotors and is constructed strong enough to provide the largest possible area of the slits. Another feature of the apparatus is a frequency converter and a high-frequency reaction motor in the drive mechanism to obtain the predetermined values of the rotation speeds and the relative-phase difference stability in a wide range of the rotation speeds. The main specifications are as follows: neutron energy range-10^{-3} to 10^{2} ev; type-twin rotors; resolution-max 2%; rotor diameters-250 mm; rotors rotation-ranges-18,000–1,000 rpm; rotor material-K monel metal; slit dimensions-1 mm wide × 48 mm high; numbers of the slits-15 and 16; slit curvature radii-2,000 mm, 5,000 mm, and ∞ (straight slits); neutron detector-plastic scintillators. (NSA of Japan)

47067 INPILE SECTION OF HELIUM-LOOP KASIMIR DESIGN AND SPECIAL DESIGN PROBLEMS. Francioni, W. M. (Federal Inst. for Reactor Research, Wuerenlingen, Ger.). Neue Tech., 8: 182-97(1966).

A brief description is given of KASIMIR, a He cooled loop for the irradiation of prototype fuel elements, which will be installed in a vertical irradiation channel of the Swiss research reactor DIORIT. The design and special design problems of the inpile thermocouple connector, fuel element drive, out-of-flux thermocouple connector, gate valve, fuel element assembly, and the fuel element discharge machine are described in detail. (auth)

47068 BURNUP CHARACTERISTICS OF D_2O-MODERATED, Pu-FUELED LATTICE. II. PHOENIX FUEL. Shindo, Ryuithi; Yasukawa, Shigeru (Japan Atomic Energy Research Inst., Tokyo). Nippon Genshiryoku Gakkaishi, 8: 410-15(1966). (In Japanese).

A report is presented on the burnup analysis of a D_2O-moderated lattice, fueled with Pu. There are a number of different ways in which Pu is used as fuel, and Pu efficiency varies therewith. The usefulness of Pu in Phoenix is described. If Pu of high ^{240}Pu content is used in the D_2O-moderated lattice, the initial excess reactivity can be reduced and a high burnup may be obtained because of the fertile ^{240}Pu. Consequently, in D_2O-moderated lattices, old Pu with high ^{240}Pu content is useful when Pu is employed as fuel. (auth)

47069 IN-SITU REPAIRS IN THE HEAVY WATER COMPONENTS TEST REACTOR. Gray, P. L. (E. I. du Pont de Nemours and Co., Aiken, S. C.). Nucl. Appl., 2: 213-20(June 1966).

After nearly two years of nuclear operation, personnel entered the pressure vessel of the Heavy Water Components Test Reactor (HWCTR) to repair and modify a gas baffle near the core while irradiated fuel remained in the reactor. The work, which involved removing virtually all the reactor internal components down to the reactor core, was completed in about three weeks. Appropriate shielding and special clothing kept radiation exposure of personnel within allowable Savannah River Plant guides. (auth)

47070 QUANTITATIVE EVALUATION OF THE NORDHEIM-FUCHS REACTOR EXCURSION MODEL WITH NONLINEAR REACTIVITY FEEDBACK. Kazi, A. Halim; Tomonto, James R.; Cherry, Bernard H. (United Nuclear Corp., Elmsford, N. Y.). Nucl. Sci. Eng., 26: 131-3(Sept. 1966).

The Nordheim-Fuchs reactor excursion model is quantitatively examined for a thermal spectrum, low-enrichment UO_2-fueled pulsed reactor, and it is concluded that the data obtained are in agreement with the predictions of Wolfe and Scalettar. The results using the simple Nordheim-Fuchs model with constant average properties are in reasonable agreement with the data using the quadratic variation of the reactivity coefficients and heat capacity with temperature. It is also concluded that using constant coefficients evaluated at the initial fuel temperature is nonconservative in predicting peak power, total energy release, and maximum core temperature for a safety analysis. For example, the total energy release is underpredicted by ≈25%. (G.O.Y.)

47071 THE USE OF HEAVY WATER IN THE RADIAL REFLECTOR OF THE POLISH HIGH-FLUX RESEARCH REACTOR. Dabrowski, Cyryl (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 109-19(1966).

The high-flux research reactor designed at present in Poland is a reactor of the MR-type and is to be used both for beam and loop experiments. The beam research program requires mainly intense pure thermal flux distribution in the radial reflector. From this point of view the use of the following reflectors was investigated: graphite-water, graphite, beryllium and heavy water. On the basis of this analysis heavy water radial reflector was proposed. Reactor variants both with heavy water reflector and with graphite reflector were analyzed to determine the changes in reactivity and losses of thermal flux and its purity caused by insertion of experimental channels and structural materials. Production of cold neutrons in these two reflectors was estimated. (auth)

47072 METHODS OF MATERIAL BUCKLING DETERMINATION IN THE HELENA SUBCRITICAL ASSEMBLIES. Dabrowski, Cyryl; Mikulski, Andrzej T. (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 121-35(1966).

A detailed analysis of the material buckling determination in the natural uranium fuelled graphite moderated HELENA subcritical assemblies was carried out by means of the following methods: thermal neutron flux measurement along the vertical axis with an assumption of the point thermal neutron source either in one-region or two-region assembly, measurement of the thermal neutron flux along the vertical axis and in one horizontal plane, measurement of the thermal neutron flux in two horizontal planes, and measurement of the thermal neutron flux in one vertical plane of the assembly. Three assemblies of 24 cm lattice pitch and the following dimensions: 180 × 180 × 237, 180 × 240 × 237 and 240 × 240 × 237 cm were investigated. The following results have been obtained: migration area anisotropy coefficient $\alpha_n = 1.056 \pm 0.045$ and material buckling $(73.5 \pm 4.3) \times 10^{-6}$ cm^{-2}. (auth)

47073 DETERMINATION OF THE EWA REACTOR POWER BY ^{16}N ACTIVITY MONITORING. Czerniewski, Michal; Szuta, Marcin; Krzycki, Andzej (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 185-91(1966).

A new method for the reactor EWA power measurement using the ^{16}N activity of the cooling water is described. The experimental results show that this method is generally free from errors caused by changes of neutron flux distribution. The indicated power lies within ±3% limits of the thermal power. The application of this method for the WWRS-type reactor power control is discussed. (auth)

47074 CRITICAL EXPERIMENTS AND THE MAIN CHARACTERISTICS OF THE ANNA ZERO POWER REACTOR. Dabek, Waclaw; Kubowski, Jerzy (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 213-26(1966).

A short description is presented of the assembly start-up, critical experiments in different core configurations and measurement of various operational characteristics. The data obtained during operation period are summarized.

Some safety aspects are considered. Present and future programs of experiments are included. (auth)

47075 METHODS AND RESULTS OF SOME STATIC MEASUREMENTS IN THE ZERO POWER REACTOR ANNA. Adamski, Leslaw; Jozefowicz, Edward T.; Jozefowicz, Krystyna; Szechter, Andrzej (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 227-40(1966).

Different core variants with 14.0 cm lattice pitch and 19.8 cm lattice pitch of zero power reactor ANNA were examined. New methods were worked out and previously used ones adapted to measure a number of following reactor static parameters and characteristics: macroscopic neutron density distributions, by means of copper wires and pins as well as miniature fission chambers; cadmium ratio and spectral index distributions, using copper pins and gold foils; intracell neutron density distributions in multilayer elementary cells, by means of spiral copper wire detectors, copper foils and pins and dysprosium foils; intracell neutron temperature and spectrum distributions using resonance foil detectors; and ρ^{28} parameter in elementary cell using the method of chromatographic separation of ^{239}Np. (auth)

47076 PROGRESS IN REACTOR KINETICS AT INSTITUTE OF NUCLEAR RESEARCH IN SWIERK. Bouzyk, Jacek; Bukowski, Kazimierz; Ciechanowicz, Wieslaw; Kubowski, Jerzy; Latek, Stanislaw; Suwalski, Witold; Szczechla, Bronislaw; Topa, Jerzy (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 241-64(1966).

The work in reactor kinetics done at the Institute of Nuclear Research in the period 1964-1965 is discussed. Two problems were the main interest: reactivity measurements in broad range, and a general study of reactor kinetics especially in high frequency or short time range. The theoretical basis including the kinetic equations solutions applicable to reactivity measurements and general classification of the methods were discussed. Several experimental techniques were examined and compared both theoretically and experimentally. The studies of reactor kinetics were initiated on the basis of inherent neutron population fluctuation investigation. (auth)

47077 REACTOR PARAMETERS MEASUREMENTS USING PULSE NEUTRON SOURCE. Chwaszczewski, Stefan; Dybowski, Kazimierz; Szechter, Andrzej (Inst. of Nuclear Research, Swierk, Poland). Nukleonika, 11: 265-75(1966).

$(\beta/l)_{cr}$ and reactivities of the control and safety elements of the zero power ANNA reactor were measured using a pulsed neutron source. The Garelis and Russel method was used for $(k\beta/l)_{eff}$ measurement in the subcritical state. The improved method for the prompt neutron period measurement is described. (auth)

47078 TEMPERATURE DISTRIBUTION IN FUEL ELEMENTS DURING FINAL LOADING OF THE VVR-S REACTOR. Stoian, D.; Mihaila, A. (Inst. of Atomic Physics, Bucharest). Rev. Roum. Phys., 11: 339-44 (1966). (In French).

Toward the end of the loading, the number of the core cells charged with fuel rods increases and consequently in the core variations of coolant water input and of power occur. This causes a change in the temperature at the surface of the rods. The results of measurements of temperatures under these conditions are presented and the measurements are discussed from the viewpoint of the safety of the reactor operation. (tr-auth)

47079 THE ZERO-ENERGY EXPERIMENT FOR THE MULTI-PURPOSE REACTOR (MZFR). Behrens, Ernst; Gruen, Arnold E.; Ritz, Hilmar (Siemens-Schuckert Research Center, Erlangen, Ger.). Siemens Rev., 33: 179-83(Mar. 1966).

The main objective of the measurements described, made during the zero-energy experiment, was the determination of the properties of the completely loaded but cold reactor without control rods. All measurements were performed in critical or subcritical states which allowed reasonably accurate extrapolation to obtain values for the state to be studied. Two ways were used to obtain critical states; the reactor core was reduced to a critical volume, and a strong neutron absorber, such as boric acid, was added to the moderator. The possibility of calibrating control rods by boron substitution has, however, a decisive limit, namely where the rod configuration under consideration has a reactivity larger than the total excess reactivity of the reactor. One parameter determined by the zero-energy experiment was the temperature coefficient which indicates how much the reactivity changes when the reactor temperature increases by 1°C. The value for the state under consideration (full water level, nonpoisoned) was calculated. The experimental and theoretical results for two critical states and the theoretical curves for the state under consideration showed close agreement, pointing to a sufficiently reliable theoretical temperature coefficient for the state under consideration. Of the various other measurements performed, one was the neutron density distribution in a radial and axial direction. Other work included measurements of the reactivity of the coolant, of the central fuel element, and of many built-in devices. (BBB)

47080 SELECTED RESULTS OBTAINED IN THE REACTOR EXPERIMENTAL STATION AT GARCHING. Engler, Hans Dietrich (Siemens-Schuckert Research Center, Erlangen, Ger.). Siemens Rev., 33: 191-6(Mar. 1966).

The investigations described give a general idea of the neutron and nuclear physical problems handled by the Reactor Experimental Station at Garching. An attempt is made, by three different examples (development of a reliable method for accurate reactivity determination that will also be suitable for power reactors, developing new applications for a special research reactor built by the Reactor Development Department at Siemens-Schuckertwerke, supply of important metallurgical data with the aid of nuclear physical measuring methods), to illustrate some of the experimental work being carried on in a reactor engineering lab. Use of training reactors is described. It was found that the method using a pulsed neutron source represents the most reliable means of determining the negative reactivity of a reactor. The experience gained with the training reactors has been utilized in the determination of various reactivity states in the zero-energy experiment of the multi-purpose reactor MZFR at Karlsruhe. Reactor oscillator measurements on the Siemens training reactor (SUR) are described. In spite of its small power and the resulting low cost, the SUR is particularly suitable for investigations based on neutron-absorption determination on material samples. In the initial measurements carried out with the SUR reactor oscillator, purity determinations of Al samples were made, as well as measurements on model fuel balls for burnup studies. By absorption measurements on standard materials (boron, cadmium) it was possible to determine indirectly characteristic quantities of the energy distribution of reactor neutrons (neutron temperature and fraction of epithermal neutrons). Investigations for determining the short-range order in ferronickel alloys by means of the Moessbauer effect are also outlined. (BBB)

47081 CALCULATION OF THE TEMPERATURE COEFFICIENT OF REACTIVITY OF A SWIMMING POOL REACTOR. Bhatnagar, S. K.; Williamson, T. G. 5p. (CONF-660547-2). ORAU. Gmelin, AED-CONF-66-122-4.

From Virginia Academy of Science, 44th Annual Meeting, Harrisonburg, Va.

The temperature coefficient of the Univ. of Virginia reactor was calculated. Three different approaches were used: two group albedo theory, perturbation theory, and multigroup diffusion theory with three fast groups and one thermal group. Experimental results are presented. (B.G.D.)

WASTE DISPOSAL AND PROCESSING

See *also* BIOLOGY AND MEDICINE — Ecology
CHEMISTRY — Radiochemistry
CHEMISTRY — Separation Processes and Procedures
HEALTH AND SAFETY

Refer also to abstracts 45571 and 45631.

47082 (AEET–250) INVESTIGATION OF MATERIALS FOR FIXATION OF LOW AND MEDIUM LEVEL RADIOACTIVE WASTE IN STABLE SOLID MEDIA. Rastogi, R. C.; Sehgal, J. D.; Thomas, K. T. (Atomic Energy Establishment, Trombay (India)). 1966. 70p. Dep. mn.

A method for fixation into vitreous matrices of spent vermiculite, synthetic chemical treatment plant sludge obtained as secondary wastes in the treatment of radioactive liquid effluents, and ashes obtained by burning contaminated combustible wastes in a pilot incinerator is described. Results on the fusion studies of the mineral vermiculite, synthetic sludge and incinerator ashes, leaching characteristics of the fused mass and volume reduction obtainable are presented. An apparatus assembled for studying volatilization losses of cesium, strontium and ruthenium during firing, a method for evaluating volatilization loss of Cs by using its stable salt, and an application of flame photometry to estimate volatilized Cs are described. Results on the loss of Cs by volatilization during firing are presented. Effect of self-absorption of radiation during final storage on corrosion resistance of glass has also been studied. (auth)

47083 (ORNL–3945, pp 79–106) WASTE TREATMENT AND DISPOSAL. (Oak Ridge National Lab., Tenn.).

Developments in studies on high-level, intermediate-level, and low-level radioactive wastes are reported. High-level wastes, which contain nearly all the fission products, are converted to solids. Intermediate-level radioactive wastes, characterized by their generally high salt content, are incorporated in asphalt; any contained water is simultaneously volatilized. Low-level wastes are treated to remove the radionuclides, and the decontaminated water is discharged to the environment or recycled for reuse. The recovered solids are combined with the intermediate-level wastes. Both the high-level and intermediate-level wastes can be shipped to an ultimate disposal site. The results of studies on: costs of perpetual storage, safety of tank storage, and an analysis of the management of wastes from volatility processes are also reported. (P.C.H.)

47084 (PEL–102) PRELIMINARY REPORT ON THE DEVELOPMENT OF A METHOD FOR THE SOLIDIFICATION OF PROCESS CONCENTRATES FROM THE RADIOACTIVE WASTE TREATMENT PLANT AT PELINDABA. Barbour, R. A.; Henwood, R. F.; Dieperink, H. B. (Atomic Energy Board, Pelindaba, Pretoria (South Africa)). Dec. 1965. 6p. Dep. mn.

A process is described for the storage and disposal of an alkaline aqueous concentrate of medium-level liquid waste. The process consists of filling a 25-gallon steel drum with a premixed blend of Portland cement and finely ground exfoliated vermiculite. The drum is sealed and cast in a block of clean concrete fitted with lifting lugs. A 1-in. bore threaded connector pipe links the lid of the drum to the top of the concrete block. The waste liquid is transferred to the drum. When the operation is complete the connector cap is sealed. Solutions containing solids in the order of 6% by weight may be solidified by this technique. (F.S.)

47085 TOWARD MORE REALISTIC SYSTEMS FOR THE DISCHARGE OF RADIOACTIVE AIRBORNE WASTES. Breslin, A. J. (Atomic Energy Commission, New York), Health Phys., 12: 1496–1501(Oct. 1966).

Certain questionable practices regarding the discharge of radioactive wastes to the atmosphere are discussed. Such practices include the restriction of the concentration of radionuclides at the top of the stack to no greater than the nonoccupational MPC, installation of unnecessary stack monitoring instruments, and the installation of unnecessary air cleaning equipment. The preparation of a simplified guide in the form of a standard or an appendix to some authoritative manual is suggested as a beginning in the development of more realistic systems for the discharge of radioactive airborne wastes. This guide should, as a minimum, indicate limits within which outside air contamination can be ignored, monitoring is unnecessary, and air cleaning is unnecessary. (R.C.K.)

47086 FLUIDIZED BED CALCINATION OF HIGH-LEVEL RADIOACTIVE WASTE IN A PLANT-SCALE FACILITY. Buckham, J. A.; Ayers, A. L.; McBride, J. A. (Phillips Petroleum Co., Idaho Falls, Idaho). Chem. Eng. Progr., Symp. Ser. Pt. 15, 62: 52–63(1966).

Operation of the plant-scale facility for converting high-level radioactive waste solutions to a safer solid form began in December, 1963, with the use of the fluidized bed calcination process. Correlated data from initial operation are presented, with emphasis on the highly satisfactory performance of the off-gas cleanup system. (auth)

47087 WASTE DISPOSAL. Fineman, P. Reactor Fuel Process., 9: 170–6(Summer 1966).

The treatment of intermediate–level activity wastes by ion exchange, electrodialysis and incorporation in asphalt is briefly reviewed. The 40 papers presented at a symposium on conversion of high-level wastes to solids held at Richland, Wash. Feb. 15 to 18, 1966 are mentioned; papers dealing with waste management, fluid-bed calcination, and conversion of wastes to glasses are reviewed in somewhat more detail. The recovery of Pr and Ce from Redox- and Purex-plant wastes are discussed. A process for separating Ce from the other rare earths is discussed in detail. (36 references). (B.L.M.)

47088 METHOD FOR THE CONVERSION OF RADIOACTIVE MATERIALS INTO A STORABLE AND TRANSPORTABLE PERMANENT FORM. Oetjen, Georg-Wilhelm; Nerge, Wilhelm; Eilenberg, Hanns; Fauser, Friedrich; Neumann, Karl-Heinz (to Leybold Hochvakuum-Anlagen GmbH). German Patent 1,220,048. June 30, 1966. Filed Oct. 21, 1960.

A process for converting radioactive waste, which is in the form of filtrable constituents in a solution, into a form suitable for handling and storage, consists of passing the solution through a filter chamber containing a filtering element that retains the waste, submitting the filtration residue to a process of vacuum freeze drying, and removing the dry waste for handling or storage. (Gmelin Inst.)

47089 FATE OF SOME RADIONUCLIDES FIXED ON ION-EXCHANGE RESINS IN SEA-WATER MEDIUM. Fukai, R. (IAEA, Monaco). Vienna, International Atomic Energy Agency, 1966, Preprint SM-72/29, 24p. (CONF-660507–19). ORAU.

From Symposium for the Disposal of Radioactive Wastes into Sea, Oceans, and Surface Waters, Vienna.

In order to measure the stability of various radionuclides, such as ^{51}Cr, ^{54}Mn, ^{59}Fe, ^{60}Co, ^{65}Zn, ^{144}Ce, and

^{144}Pr on different kinds of ion-exchange resins used for waste treatment in seawater, elution experiments on resin-fixed radionuclides with seawater were carried out by using the normal column method as well as the "anti-column method." With Dowex 50W exchange resin there was considerable elution of all the radionuclides employed but with a chelating resin Chelex 100 there was much less elution and in some cases practically none. This was attributed to the differences between the stabilities of radionuclides on different resins. It was proved that the elution of radionuclides is mainly caused by the presence of magnesium ions in seawater. On the basis of the results obtained the possible chemical behavior of these radionuclides if they were to be discharged into the sea sorbed on resins is discussed. In parallel with the elution experiments, the sinking velocities of the various resin particles were measured. Combining the observed velocities with assumed physical conditions of water masses in situ, possible distribution of resin particles at the sea bottom is also discussed. The results obtained point to a substantial difference in the effectiveness of accumulation of various fission products in marine detritus. The portion of these products in the suspended material in seawater is not large, and hence the major part of the artificial radionuclides in the ocean exists in the ionic or colloidal state. (auth)

47090 SITE EVALUATIONS AND THE DISCHARGE OF AQUEOUS RADIOACTIVE WASTES FROM CIVIL NUCLEAR POWER STATIONS IN ENGLAND AND WALES. Preston, A. (Ministry of Agriculture, Fisheries and Food, Lowestoft, Eng.). Vienna, International Atomic Energy Agency, 1966, Preprint SM-72/46, 16p. (CONF-660507–28). ORAU.

From Symposium for the Disposal of Radioactive Wastes into Sea, Oceans, and Surface Waters, Vienna.

The role of site evaluations in the control of radioactive waste disposal to aquatic environments in the United Kingdom is outlined. The principal aims of these assessments are stated, and the various interacting factors on which the evaluation of the maximum rate of discharge depends are briefly discussed. The results of six such evaluations carried out for civil nuclear power station sites in England and Wales are presented and compared. Early operational monitoring data are shown to be consistent with estimates based on original site evaluations. (auth)

GENERAL AND MISCELLANEOUS

47091 (BNWL–113-19) PLUTONIUM ABSTRACTS, VOLUME 6, NUMBER 7. (Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.). Aug. 31, 1966. Contract AT(45-1)-1830. 36p. CFSTI $3.00 cy, $0.50 mn.

Eighty-five references are given to U. S. and foreign journals and reports published from Oct. 1964 through Aug. 1966. The subjects covered include: biology and medicine; chemistry; health and safety; metallurgy; physics; and reactor technology. (P.C.H.)

47092 (SC-CR-66-2047) BOOSTER ROCKET ALTITUDE ABORT PROGRAM. Final Report. Carpenter, H. J.; Ottinger, R. S.; Peterson, J. B.; So, K. L.; Van Nice, L. J. (TRW Systems, Redondo Beach, Calif.). July 1966. Contracts AT(29-1)-789; 48-2223. 152p. Dep. mn. CFSTI $5.00 cy, $1.00 mn.

For Sandia Corp., Albuquerque, N. Mex.

Analytical models were developed for the prediction of the prompt fireball blast environment and late fire-stream thermal environment of an altitude booster abort. The prompt fireball model for cryogenic and hypergolic propellants was based on the analysis of experimental liquid propellant vehicle abort data and theoretical analyses of the effect of vehicle motion on blast characteristics. The late firestream model was based on theoretical descriptions of turbulent wake flow. The nature and probability of solid rocket booster aborts also were assessed. In the interest of rapid safety hazard assessment, the calculation of the spatial distribution of the temperature and energy release-time history of fireballs resulting from booster propellant aborts at altitudes of 10,000 to 70,000 feet was reduced to graphical form. (auth)

47093 (UCRL–50116) EXPANSION OF A CUTTING TOOL DURING CHIP REMOVAL. Bryan, James B.; Clouser, Richard W.; McClure, Eldon R. (Lawrence Radiation Lab., Univ. of California, Livermore). July 21, 1966. Contract W-7405-eng-48. 7p. Dep. mn. CFSTI $1.00 cy, $0.50 mn.

A simple experimental procedure was developed for determining the expansion of the cutting tool during a turning operation. The experiment revealed the magnitudes of possible size and form errors due to tool expansion, the variation of effects with speed, feed, and depth of cut, and the effectiveness of coolant as a means of reducing the error. (auth)

47094 ADVANCES IN NUCLEAR SCIENCE AND TECHNOLOGY. VOLUME 3. Greebler, Paul; Henley, Ernest J. (eds.). Advances Nucl. Sci. Technol., 3: 1-400(1966).

Papers are presented on the physics of pulsed neutrons, transient radiation effects in electronics, radiation effects on inorganic solids, synthesis methods in reactor analysis, radioinduced polymerization at low temperature, and pulsed neutron sources. A separate abstract was prepared for each paper. (M.C.G.)

For abstracts of individual papers see: 45716, 46098, 46564, 46565, 46944, and 46967.

47095 APPLICATIONS OF NUCLEAR SPECTROSCOPY. Lowman, Frank G. (Puerto Rico Nuclear Center, Mayaguez). pp 49-52 of I Conferencia de Espectroscopia Nuclear y Fisica del Estado Solido. Lima, Organizacion de Universidade Catolicas de America Latina, 1964.

The application of nuclear techniques to marine biology and oceanography at the Puerto Rico Nuclear Center is described. Among the nuclear techniques used are activation analysis, γ spectrometry, coincidence γ spectrometry, and β spectrometry. (J.S.R.)

47096 PROCEEDINGS OF THE 1965 CONFERENCE, ATOMIC INDUSTRIAL FORUM, INC., WASHINGTON, D. C. McCluskey, Robert J. (ed.). Atomforum/65. New York, Atomic Industrial Forum, 1966. 280p. $15.00. (CONF-651132).

The development of nuclear energy is discussed with emphasis on the areas of marine applications of nuclear energy, economics of nuclear fuels, international development programs, industrial aspects of international safeguards, saline water conversion, space applications, and non-power applications of isotopes and radiation. Separate abstracts were prepared for six of the papers presented and seven papers were previously abstracted for NSA. For abstract numbers of these seven papers see CONF-651132 in the Report Number Index. (H.D.R.)

For abstracts of individual papers see: 45927, 46122, 47007, 47038, 47058, and 47059.

CORPORATE AUTHOR INDEX

This index contains entries for this period for all report literature and, in addition, for certain published literature items for which it is felt that a corporate approach is especially desirable, e.g., symposia, conference proceedings, and meetings.

Each entry under a corporate author is a shortened version of the title of the publication, followed by the NSA volume and abstract number. Report numbers are given in parentheses.

The phrase "Progress report" is abbreviated as "Prog. rpt.," permitting a more rapid and complete alphabetical arrangement of the titles without changing the location of the progress report titles in relation to the other titles.

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AEROSPACE RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Limiting cases in the theory of spherical plasma probes, 20: 46808 (AD-639956)

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Diffraction interaction of nucleons and complex particles with nuclei, 20: 46590 (NP-16309)

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Void measurements in regions of sub-cooled and low-quality boiling. I., 20: 45854 (AE-238)

AMES LAB., IOWA STATE UNIV. OF SCIENCE AND TECH.
Lepton polarization in production of N* by neutrinos, 20: 46334 (IS-T-96)
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Charge collection and charge-collection time in semiconductor particle detectors, 20: 46033 (ANL-7226)
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ARMY NUCLEAR DEFENSE LAB., EDGEWOOD ARSENAL, MD.
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GOSUDARSTVENNYI KOMITET PO ISPOL'ZOVANIYU ATOMNOI ENERGII SSSR, MOSCOW. INSTITUT TEORETICHESKOI I EKSPERIMENTAL'NOI FIZIKI.
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Stabilization of scintillation spectrometers, 20: 46041 (FEI-37)
GRENOBLE UNIV. (FRANCE).
Radiosensitivity of Chlorella after electron irradiation, 20: 45353 (CEA-R-2984)

H

HEALTH AND SAFETY LAB., NEW YORK OPERATIONS OFFICE (AEC), N. Y.
Automatic sampler for collecting radioactive particulates in ground level air, 20: 45950 (HASL-178)
Point source detection by scintillation survey meter, 20: 46042 (HASL-177)
Spectral energy distribution of unfiltered x-rays from a 250 kV constant potential machine, 20: 45951 (HASL-179)
HRB-SINGER, INC., STATE COLLEGE, PA.
Preliminary infrared fire mapping systems analysis, 20: 45939 (AD-639594)
HUDSON INST., INC., HARMON-ON-HUDSON, N. Y.
Methodology for postattack research, 20: 45952 (HI-647-RR)
HYDRONAUTICS, INC., LAUREL, MD.
Cavitation damage in liquid metals, 20: 46154 (NASA-CR-72035)

I

IIT RESEARCH INST., CHICAGO, ILL.
Prog. rpt. on reactor containment, 6–7/66, 20: 46982 (IITRI-578P21-21)
ILLINOIS UNIV., URBANA.
Reaction (p,n) on ^{91}Zr, 20: 46577 (AD-630032)
INSTITUT ATOMNOI ENERGII, GOSUDARSTVENNYI KOMITET PO ISPOL'ZOVANIYU ATOMNOI ENERGII SSSR, MOSCOW.
Extracted teeth as method for mass control of ^{90}Sr content in man, 20: 45956 (NP-16257)
Relationship between the ^{90}Sr and ^{137}Cs contents in environment and in man, 20: 45886 (NP-16262)
Shell corrections for the classical nuclear energy model, 20: 46610 (ANL-Trans-353)
Some peculiarities of ion beam focusing by linear stationary fields, 20: 46258 (NP-16312)
Thermalization of plasma in Tokamak installations, 20: 46811 (IAE-1154)
INSTITUT FUER KERNPHYSIK, UNIVERSITAET FRANKFURT (WEST GERMANY).
Deuterium and tritium gas targets, 20: 46255 (IKF-18)
Neutron absorption cross sections and transmission coefficients from a non-local optical model, 20: 46583 (IKF-17)
INSTITUTE OF NUCLEAR PHYSICS, KRAKOW (POLAND).
Magnetic properties of the ^{171}Tm nucleus, 20: 46585 (IMP-482/PL)
Program for digital computer UMC-1 for calculation of life time of an excited state measured by delayed coincidences, 20: 46584 (IMP-472/PL)
INSTITUTE OF NUCLEAR RESEARCH, WARSAW (POLAND).
Problem of dynamical groups in quantum mechanics, 20: 46500 (INR-687/VII/PH)
Symmetrical back-reflection focusing camera combined with x-ray microfocus tube, 20: 46012 (INR-697/XIV/PS)
INSTITUTE OF PLASMA PHYSICS, UNIV. OF NAGOYA (JAPAN).
Prog. rpt. on plasma physics, annual, 4/65–3/66, 20: 46819 (NP-16293)
INTER-AMERICAN INST. OF AGRICULTURAL SCIENCES, TURRIALBA (COSTA RICA).
Prog. rpt. on application of nuclear energy to agriculture, annual, 7/66, 20: 45248 (NYO-2043-129)
INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA).
Conference on computer calculation of dose distribution in radiotherapy,

Vienna, 10/65, 20: 45510 (STI-DOC-10-57)

IOWA STATE UNIV. OF SCIENCE AND TECHNOLOGY, AMES. ANTIGENIC LAB.
Prog. rpt. on genetic effects of irradiating swine, annual, 6/65-7/66, 20: 45362 (TID-23311)

ISOCHEM INC., RICHLAND, WASH.
Sealing of plastic film by electronic welding for alpha contamination control, 20: 45953 (ISO-SA-23)

ISOTOPES, INC., WESTWOOD, N. J.
Prog. rpt. on Project STREAK, 7-9/66, 20: 45888 (NYO-3654-1)

J

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF PHYSICS.
Direct evidence for and transition rates of ion pair interactions in $LaCl_3:Ho^{3+}$, 20: 45621 (AD-640612)

JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR).
Determination of parameters of a charged particle moving in a stopping scatterer placed into an inhomogeneous magnetic field, 20: 46812 (JINR-P-2829)

JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR). LAB OF NUCLEAR PROBLEMS.
Fluctuations in showers produced by 45- to 330-Mev electrons, 20: 46927 (JINR-P-2846)

JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR). LAB OF NUCLEAR REACTIONS.
Preparation of spontaneously fissioned ^{240}Am and ^{242}Am isomers in neutron transfer reactions, 20: 46586 (JINR-P-2769)

JOINT INST. FOR NUCLEAR RESEARCH, DUBNA (USSR). LAB OF THEORETICAL PHYSICS.
Possibility of quark-molecule formation, 20: 46335 (JINR-P-2871)
Proton transfer in a weakly bound state, 20: 46587 (JINR-P-2794)

K

KANSAS UNIV., LAWRENCE. DEPT. OF GEOLOGY.
Effects of ultraviolet light illumination on thermoluminescence of calcite, 20: 45914 (BNL-10561)

KERNENERGIEANLAGEN, ALLGEMEINE ELEKTRICITAETS-GESELLSCHAFT, FRANKFURT AM MAIN (WEST GERMANY).
Prog. rpt. on BWR stability studies, 1–3/66, 20: 46965 (EURAEC-1608)

KERNFORSCHUNGSANLAGE, JUELICH (WEST GERMANY).
Boiling water fuel element loop in FRJ-2, 20: 47064 (JUL-373-RB-RX)

KERNFORSCHUNGSANLAGE, JUELICH (WEST GERMANY). INSTITUT FUER PLASMAPHYSIK.
A 40 kv condenser bank of extremely low internal inductance, 20: 46815 (JUL-374-PP)
Adiabatic invariance in mean of spatial field reversal, 20: 46817 (JUL-384-PP)
Electrodeless acceleration of plasma for space propulsion system, 20: 46813 (JUL-358-PP)
Production of series limit continua with the help of sliding sparks for the absolute measurement in the vacuum ultraviolet, 20: 46814 (JUL-360-PP)
Prog. rpt. on plasma physics, annual, 1965, 20: 46816 (JUL-381-PP)

KERNFORSCHUNGSANLAGE, JUELICH (WEST GERMANY). INSTITUT FUER REAKTORBAUELEMENTE.
Thermodynamic values for air, CO_2, and Ni at high temperatures and pressures, 20: 45624 (JUL-383-RB)

KNOLLS ATOMIC POWER LAB., SCHENECTADY, N. Y.
Thermal calculations for cylindrical fuel rods based on the Robertson concept, 20: 47005 (CONF-661001-7)

KUNGLIGA VETENSKAPSAKADEMIEN, KIRUNA (SWEDEN). GEOFYSISKA OBSERVATORIET.
Prog. rpt. on solar ionizing radiation measurements, final, 7/1/62–6/30/65, 20: 46451 (AD-628761)

L

LABORATORI NAZIONALI DI FRASCATI, COMITATO NAZIONALE PER L'ENERGIA NUCLEARE (ITALY).
Infrared radiative corrections for colliding beam (electrons and positrons) experiments, 20: 46257 (LNF-66/38)
Photoproduction of neutral pions at 500 to 800 Mev, 20: 46336 (LNF-66/37)

LABORATORIO DE FISICA E ENGENHARIA NUCLEARES, JUNTA DE ENERGIA NUCLEAR, SACAVEM (PORTUGAL).
Phase equilibria in U–Co–Fe alloys in partial range $U–UCo_2–UFe_2$, 20: 46187 (LFEN-39)

LAWRENCE RADIATION LAB., UNIV. OF CALIFORNIA, BERKELEY.
Automatic acceleration and speed control for analytic ultracentrifuge, 20: 46017 (UCRL-16932)
Branch points in angular momentum plane, 20: 46391 (UCRL-17068)
Computer-controlled 4096-channel semiconductor detector system with stabilization, 20: 46052 (UCRL-16814)
Determination of the energy dependence of the form factor in $K^+_{\beta 3}$ decay, 20: 46345 (UCRL-17087)
Flying spot digitizer, 20: 46053 (UCRL-17114)
FORTRAN Program KINE: calculating quantities for particle interactions and decays, 20: 46343 (UCRL-11650(Rev.))
Gamma-vibrational bands in ^{182}Os and ^{184}Os, 20: 46604 (UCRL-16969)
High-energy particle data, 20: 46342 (UCRL-2426(Vol.4)(1966 Ed.))
High-voltage lithium-drifted silicon detectors, 20: 46051 (UCRL-16718)
Low energy π-π interaction studies from K_{e4} decays, 20: 46346 (UCRL-17088)
Magnetostrictive readouts for spark chambers, 20: 46054 (UCRL-17122)
Nuclear spins of (45 min) ^{125}Cs and (13 day) ^{136}Cs; hyperfine-structure separations and nuclear magnetic moments of ^{125}Cs, ^{136}Cs, and (6.2 hr) ^{127}Cs, 20: 46605 (UCRL-16998)
Omnitron: a multipurpose accelerator, 20: 46259 (UCRL-16828)
Physicochemical properties of E. coli F'Lac episome, 20: 45365 (UCRL-17065)
Range-energy and dE/dx plots of charged particles in matter, 20: 46611 (UCRL-2426(Vol.2)(1966 Rev.))
Recent progress in meson and baryon spectroscopy. I., 20: 46344 (UCRL-16968)
Study of the internal conversion electrons emitted within three nanoseconds after the spontaneous fission of ^{252}Cf, 20: 46603 (UCRL-16798)
Super suppressors in Saccharomyces cerevisiae, 20: 45364 (UCRL-16851)

LAWRENCE RADIATION LAB., UNIV. OF CALIFORNIA, LIVERMORE.
Analog computer study of current rise time improvements for 2X capacitor bank, 20: 45829 (UCRL-70034)
ASTRON fast-pulsing system, 20: 46829 (UCRL-70019)
Brake system for masterslave manipulators, 20: 46016 (UCRL-14734)
Current-regulated d-c supplies with high efficiency and low cost, 20: 45839 (UCRL-70020)
Effects of the ϵ^0-ρ^0 interference on the decay distribution, 20: 46347 (UCRL-50101)
Electrical properties of dielectric liquids in a radiation field, 20: 46228 (UCRL-70022)
Expansion of a cutting tool during chip removal, 20: 47093 (UCRL-50116)
Explosively-actuated high-voltage switch for ASTRON fast-pulse system, 20: 46832 (UCRL-70030)
Fabrication of shallow, diffused Si diodes, 20: 46050 (UCRL-14651)
Graphical method for calculating dose in man from individual radionuclides in fallout, 20: 45891 (UCRL-14922)
Investigation of threshold photoneutron cross sections for iron and bismuth, 20: 46602 (UCRL-14942)
Liquid He cryopumps for a large plasma research machine, 20: 46831 (UCRL-70024)
Lock-in amplifier used in atomic cross-section measurements, 20: 46018 (UCRL-70016)
Magnetic field generated by a helical guiding coil in the Astron tank, 20: 46825 (UCID-15022)
Mercury-jet switch, 20: 46827 (UCRL-70014)
Modular design 300-kw d-c power supply system, 20: 45838 (UCRL-70017)
One-dimensional calculation of the time-dependent conductivity of gases with a strong variable source of ionization, 20: 46826 (UCRL-14914)
Possibility of radial losses of E-layer during injection phase due to negative mass instability, 20: 46824 (UCID-15018)
Programmed mechanical design of air-core solenoids constructed from hollow conductor, 20: 45840 (UCRL-70029)
Protection circuitry for ASTRON fast pulser, 20: 46830 (UCRL-70021)
Release of radioactivity from nuclear cratering experiments, 20: 45833 (UCRL-14778)
Replacement thyratron for ASTRON accelerator, 20: 46828 (UCRL-70015)
Roof slab doors for hot cells, 20: 45837 (UCRL-14733)
Synthesis and evaluation of complex polyammonium hydrides, 20: 45702 (UCRL-13222)
Thermal stresses in infinite flat plates, 20: 45828 (UCRL-14737)

LINCOLN LAB., MASSACHUSETTS INST. OF TECH., LEXINGTON.
Geometry and patterns of LASA, 20: 45911 (AD-628148)

LOMA LINDA UNIV., LOS ANGELES, CALIF.
Prog. rpt. on relation of viruses to radiation and radioactive substances, 10/65-9/66, 20: 45288 (SAN-322-4)

LOS ALAMOS SCIENTIFIC LAB., UNIV. OF CALIFORNIA, N. MEX.
Calculations of neutron cross sections using a local optical potential with average parameters, 20: 46555 (LA-3538(Vol.1))
Calculations of neutron cross sections using a local optical potential with average parameters, 20: 46556 (LA-3538(Vol.2))
Contribution of industrial hygiene to protection of radiation worker,

20: 45954 (LA-DC-7582)
Irradiation of liquid Pu fuels in a thermal reactor, 20: 46227 (LA-3557)
Los Alamos meson factory: present status and future plans, 20: 46256 (LA-DC-7642)
Production of heavy elements in recent Los Alamos thermonuclear test, 20: 45766 (LA-DC-8103)
Pulsed fast neutron research at Los Alamos Van de Graaff accelerator, 20: 46588 (LA-DC-7853)
Pulsed field skin effect calculations for cylindrical conductors, 20: 45827 (LA-3500)

LOS ANGELES COUNTY GENERAL HOSPITAL, CALIF.
Prog. rpt. on relation of viruses to radiation and radioactive substances, 10/65-9/66, 20: 45288 (SAN-322-4)

LOUISIANA STATE UNIV., NEW ORLEANS. DEPT. OF CHEMISTRY.
Extraction of anionic metal chelates by long-chain alkyl ammonium compounds, 20: 45800 (ORO-2576-23)

LOVELACE FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH, ALBUQUERQUE, N. MEX. DEPT. OF MICROBIOLOGY.
Immune response to Leptospira and infectious hepatitis in beagles exposed to ^{90}Sr, 20: 45320 (LF-29)

M

MALLINCKRODT CHEMICAL WORKS, WELDON SPRING, MO. URANIUM DIV.
Green salt-water equilibrium studies, 20: 45625 (MCW-1448)

MANLABS, INC., CAMBRIDGE, MASS.
Analysis of vaporization of liquid U, metal, and C systems at 9000° and 10,000°R, 20: 45626 (NASA-CR-591)

MARTIN CO., BALTIMORE, MD.
Prog. rpt. on radiation effects on MOS circuits, 7/65-9/65, 20: 46097 (AD-63044)

MARYLAND UNIV., COLLEGE PARK.
Neutron production by fusion in a class of anisotropic plasmas, 20: 46807 (AD-639658)
Short-time, high-temperature creep strength of Mo–0.5% Ti, 20: 46182 (AD-630070)

MARYLAND UNIV., COLLEGE PARK. DEPT. OF PHYSICS AND ASTRONOMY.
Evidence for a doublet at 5.96 Mev in ^{10}Be, 20: 46595 (ORO-2098-49)
Experimental determination of the branching ratio of the Σ^+, 20: 46339 (ORO-2504-98)

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF GEOLOGY AND GEOPHYSICS.
Prog. rpt. on variations in isotopic abundances of Sr, Ca, and Ar and related topics, annual, 1964, 20: 45916 (MIT-1381-12)

MAX-PLANCK-INSTITUT FUER KERNPHYSIK, HEIDELBERG (WEST GERMANY).
Form factors for DWBA calculations of the $^{54,52,50}Cr(^3He,\alpha)$ reactions leading to isobaric analog states, 20: 46593 (ORNL-P-2437)
Prog. rpt., annual, 1965, 20: 46580 (BMWF-FBK-66-05)

MICHIGAN UNIV., ANN ARBOR.
Boundary layer analysis of two-phase flow over circular cylinder and oscillating flat plate, 20: 45853 (AD-639219)

MILAN UNIV. (ITALY).
Comparisons between on-shell and off-shell methods for two-body T-matrix, 20: 46392 (UCSD-10P10-9)

MINNESOTA UNIV., MINNEAPOLIS. DEPT. OF ELECTRICAL ENGINEERING.
Prog. rpt. on basic processes in gaseous discharge plasmas, final, 7/60–7/66, 20: 46809 (AD-640582)

MINNESOTA UNIV., MINNEAPOLIS. SCHOOL OF PHYSICS.
Prog. rpt. on solid-state and low-temperature physics, annual, 1966, 20: 46509 (COO-1569-1)

MOUND LAB., MIAMISBURG, OHIO.
Neutron multiplication determination of ^{238}Pu dioxide, 20: 45955 (MLM-1340)
Neutron spectrometer utilizing principle of charged particle collimation, 20: 46043 (MLM-1339)

N

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, CLEVELAND, OHIO. LEWIS RESEARCH CENTER.
Conference on high-vacuum technology, testing, and measurement, Lewis Research Center, Cleveland, Ohio, 6/65, 20: 45874 (NASA-TM-X-1268)
Enhancement of superconducting current-carrying capacity in Nb through H treatment, 20: 46510 (NASA-TN-D-3638)
Investigation of Nb-modified TAZ-8 superalloy, 20: 46166 (NASA-TN-D-3597)
Ion beams used to accelerate H propellant along magnetic tube, 20: 45869 (NASA-TN-D-3656)
Mechanical properties of dilute W–Re alloys, 20: 46189 (NASA-TN-D-3483)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, HOUSTON, TEX. MANNED SPACECRAFT CENTER.
Energy and angular distributions of electrons ejected from He by 200- and 300-kev protons, 20: 46294 (NASA-TN-D-3641)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, HUNTSVILLE, ALA. GEORGE C. MARSHALL SPACE FLIGHT CENTER.
Beryllium metal removal techniques, 20: 46165 (NASA-TM-X-53453(Vol.3))

NATIONAL INST. OF RADIOLOGICAL SCIENCES, CHIBA (JAPAN).
Radioactivity survey data in Japan, No. 8, 8/65, 20: 45887 (NP-16290)

NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.
Random walk treatment of neutron diffusion in slabs, 20: 46551 (AD-640260)

NAVAL RADIOLOGICAL DEFENSE LAB., SAN FRANCISCO, CALIF.
Beta spectra. I. FORTRAN program for composite spectra, 20: 46606 (USNRDL-TR-1033)
DNA synthesis in mixed cultures of dog leucocytes, 20: 45319 (AD-640261)
Modification of tissue distribution of in vivo ^{125}I–UdR labeled transplanted marrow, 20: 45348 (AD-637782)
Polar transport characteristics of Sr corn root segments, 20: 45269 (AD-639699)
Prediction system for neutron-induced activity contribution to fallout exposure rates, 20: 45885 (AD-639446)
Sequestration of erythrocytes in irradiated dogs, 20: 45349 (AD-639299)
Structural properties of lithium fluoride single crystals, 20: 46940 (AD-640317)
Transport of Ca and Sr in primary root of Zea mays, 20: 45270 (AD-639836)
X-irradiation of defined areas of heads of weanling rats, 20: 45350 (AD-640158)

NAVAL RESEARCH LAB., WASHINGTON, D. C.
Damaging neutron exposure criteria for evaluating the embrittlement of reactor pressure vessel steels, 20: 46228 (NRL-6415)
Neutron production by fusion in a class of anisotropic plasmas, 20: 46807 (AD-639658)

NORSK HYDRO'S INST. FOR CANCER RESEARCH, OSLO.
Radiocesium contamination of beer in Norway, 20: 45957 (NYO-3364-23)

NORSK RADIUMHOSPITAL, OSLO.
Radiocesium contamination of beer in Norway, 20: 45957 (NYO-3364-23)

NORTHEASTERN UNIV., BOSTON, MASS.
Prog. rpt. on elementary particles and relativity theory, final, 1962–65, 20: 46499 (AD-629763)

NUCLEAR METALS, INC., WEST CONCORD, MASS.
Prog. rpt. on semi-continuous pressure sintering, 5/65–4/66, 20: 46160 (AD-638453)

O

OAK RIDGE GASEOUS DIFFUSION PLANT, TENN.
Inhalation cases of enriched insoluble uranium oxides, 20: 45284 (K-C-822)

OAK RIDGE NATIONAL LAB., TENN.
Absolute efficiency measurements of NE-213 organic phosphors for detecting 14.4- and 2.6-Mev neutrons, 20: 46047 (ORNL-3899)
ACTIFK: general analysis code for O5R, 20: 46558 (ORNL-3856)
Analysis of the analogue state resonances in $^{208}Pb(p,p_0)^{208}Pb$ and $^{208}Pb(p,p')^{208}Pb^*$ processes, 20: 46594 (ORNL-P-2438)
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Bibliography on computer codes literature on shielding, 20: 46934 (ORNL-RSIC-15)
Biochemical separations, 20: 45797 (ORNL-3945, pp 199-207)
Chemical applications of nuclear explosions, 20: 45570 (ORNL-3945, pp 189-94)
Chemical engineering research, 20: 45798 (ORNL-3945, pp 230-2)
Chemistry of protactinium, 20: 45628 (ORNL-3945, pp 209-17)
Critical experiments, 20: 45958 (ORNL-3973(Vol.1), pp 14-25)
Critical parameters of U–Al alloy slugs, 20: 46994 (ORNL-3272)
Curium processing, 20: 45792 (ORNL-3945, pp 129-40)
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Mathematics and computer programs, 20: 46930 (ORNL-3973(Vol.1), pp 52-9)
Mechanisms of separations processes, 20: 45575 (ORNL-3945, pp 228-9)
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Nuclear and reactor physics, 20: 46592 (ORNL-3973(Vol.1), pp 1-13)
Operation of Molten Salt Reactor Experiment, 20: 47015 (ORNL-P-2397)
OR TEP: FORTRAN thermal-ellipsoid plot program for crystal structure illustrations, 20: 45627 (ORNL-3794(Rev.))
Physical aspects of seed irradiations, 20: 45360 (ORNL-P-2435)
Power-reactor fuel processing, 20: 45788 (ORNL-3945, pp 27-47)
Preparation and properties of actinide-element oxides, 20: 45630 (ORNL-3945, pp 241-7)
Prog. rpt. on chemical technology, annual, 6/65-5/66, 20: 45787 (ORNL-3945)
Prog. rpt. on neutron physics, annual, 5/65–5/66. I., 20: 46240 (ORNL-3973(Vol.1))
Prog. rpt. on neutron physics, annual, 5/65–5/66. II., 20: 46931 (ORNL-3973(Vol.2))
Prog. rpt. on radioisotopes program, annual, 1965, 20: 46102 (ORNL-4013)
Radiation detector studies, 20: 46048 (ORNL-3973(Vol.1), pp 60-4)
Radiation detector studies. II., 20: 46049 (ORNL-3973(Vol.2), pp 96-103)
Radiation shielding information center, 20: 46929 (ORNL-3973(Vol.1), pp 48-51)
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Ultrasonic measurement of the nonlinearity parameters of copper single crystals, 20: 46943 (ORNL-TM-1573)
Waste treatment and disposal, 20: 47083 (ORNL-3945, pp 79-106)

OHIO STATE UNIV., COLUMBUS.
Some measured properties of external proton beam at ZGS, 20: 46254 (COO-1545-13)

OKLAHOMA UNIV. RESEARCH INST., NORMAN.
Prog. rpt. on photoprotection against x-ray induced damage, final, 1966, 20: 45363 (TID-23347)

OREGON STATE UNIV., CORVALLIS. DEPT. OF OCEANOGRAPHY.
Artificial radionuclides in Pacific Salmon, 20: 45961 (RLO-1750-8 (Vol.3)(Paper 2))
Distribution of Nephyts Caecoides in Yaquina Bay, 20: 45263 (RLO-1750-8(Vol.3)(Paper 1))
Prog. rpt. on ecological studies of radioactivity in Columbia River and adjacent Pacific Ocean, annual, 7/65-6/66, 20: 45260 (RLO-1750-8 (Vol.2))
Prog. rpt. on ecological studies of radioactivity in Columbia River and adjacent Pacific Ocean, annual, 7/65-6/66, 20: 45262 (RLO-1750-8(Vol.3))
Radioactivity of sediments in Columbia River estuary, 20: 45890 (RLO-1750-8(Vol.2)(Paper 2))
Retention of ^{65}Zn by Columbia River sediment, 20: 45261 (RLO-1750-8(Vol.2) (Paper 1))

P

PARIS UNIV. (FRANCE).
Construction of β-X fluorescence gauge for chemical analysis, 20: 46010 (CEA-R-2970)

PARIS UNIV. (FRANCE). FACULTE DES SCIENCES.
Evidence for fluctuations in statistical model cross sections from the study of ^{27}Al(d,α)^{25}Mg reaction, 20: 46581 (CEA-R-2876)

PARMA UNIV. (ITALY). ISTITUTO DI ZOOLOGIA E ANATOMIA COMPARATA.
Prog. rpt. on ecology of Acantharia in relation to Sr circulation in sea 12/65-8/66, 20: 45258 (IAEA-2607-12)

PICATINNY ARSENAL, DOVER, N. J.
Effects of ultraviolet light illumination on thermoluminescence of calcite, 20: 45914 (BNL-10561)
Measurement of charge trapping centers in geological specimens, 20: 45913 (BNL-10545)

PITTSBURGH UNIV., PA.
Prog. rpt. on scattering theory of atomic collisions, 3/65–2/66, 20: 46293 (AD-628812)

PONTIFICIA UNIVERSIDADE CATOLICA DO RIO DE JANEIRO BRAZIL.
Natural radioactivity in Brazil, 20: 45259 (NYO-2577-3)

PRINCETON UNIV., N. J.
Long range effective force in nuclei and the free nucleon-nucleon force, 20: 46340 (PUC-937-224)
Prog. rpt. on particle physics, annual, 4/65–4/66, 20: 46242 (TID-23239)

PRINCETON UNIV., N. J. PALMER PHYSICAL LAB.
Data reduction program HYPERFINE-4A, 20: 46139 (PUC-937-175)
Nuclear spectroscopy in $1f_{7/2}$ region by (p,d) and (p,t) reactions, 20: 46596 (PUC-937-211)

PRINCETON UNIV., N. J. PLASMA PHYSICS LAB.
Evaluation of arc damage to power triode grid wires, 20: 46818 (MATT-383)

PRODUCTION GROUP, UNITED KINGDOM ATOMIC ENERGY AUTHORITY, ANNON (SCOTLAND).
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Because of problems involving the mechanical preparation of this index, all accent marks are omitted. The following changes in spelling have been introduced to reduce some of the confusion which might result from omitting the accents:

ä	becomes	ae
ö		oe
ø		oe
ü		ue (except in transliterated Chinese names)

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SUBJECT INDEX

Main entries in this index are generally specific materials, things, and processes. These are followed by modifiers that describe the properties of, and processes applied to, the main entries.

The number preceding the colon is the *NSA* volume number, and the number following is the abstract number. The designation (R) following the abstract number indicates that the abstract is of a progress report; (P) indicates a patent; and (T) indicates a translation. Abstracts for reports other than progress reports carry no letter designation. References to report numbers, where appropriate, are included after the abstract number of the citation. Published literature (journal article or book) is identifiable by the absence of a report number.

The user should bear in mind that the ideas presented in the original literature, rather than key words, have been indexed. The indexers have tried to select what seemed the most probable and logical place to look for typical information. Since it is not possible to anticipate where a user would look for information, numerous cross references are included in cumulative indexes to assist him in his search.

Experience in using an index of this type will be the best guide in obtaining the desired information, and a consideration of synonymous or closely related terms will prove valuable.

Information must be so indexed as to be of the greatest use to the greatest number of users. This requires that a topic be indexed to headings that most specifically describe it and not ordinarily to the headings that describe its ultimate use, nor to the general class headings that include the specific headings. For example, information on the treatment of thyroid disease with I-131 would be indexed under Thyroid Gland and under Iodine Isotopes I-131, but not necessarily under Radiotherapy. A study of the effects of x radiation on hair would be indexed under both X Radiation and Hair. However, the information would not be indexed under the experimental animal, e.g., Rats, unless the report discusses the effects on rat hair as compared with the effect on the hair of other animals.

The broad, general class headings are used only for general information or for comprehensive reports or articles.

Subject Heading Styles

Generally, the direct form of subject entry is used rather than inverted headings, e.g., Amino Acids rather than Acids, Amino; Helium Isotopes He-4 rather than Helium—isotopes He-4 or Helium—He-4 isotopes. Note, however, that in some cases parenthetic modifying terms or inverted headings of the form Neutrons, Fast are used in preference to a direct entry that would result in the scattering of information. Organic compounds are usually entered in the index in the inverted form so that substituted compounds can be listed near the parent compound; e.g., Benzene, Bromo- rather than Bromobenzene. In general, the style of nomenclature used is that of Chemical Abstracts, except that some items listed in that publication as subheadings are elevated to form part of the main heading; e.g., Butyric Acid, Methyl Ester rather than Butyric Acid—methyl ester.

Alphabetization

Main headings are alphabetized word-by-word. A parenthetic qualifier following a main heading is disregarded in alphabetizing unless there are two or more headings identical except for the parenthetic qualifier, in which case the qualifier determines the order. Headings involving Greek letters are arranged as if the names of the letters were spelled out.

Examples:

M-Capture
see Electron Capture
Magnesium
Magnesium Alloys
Manganese Fluorides
Manganese(II) Fluorides
Mesons
Mesons (π)
Mesons (ρ)
3-Pentanol, 2,4-Dimethyl-
2-Pentanol, 2-Methyl-
2-Pentanol, 4-Methyl-

Nomenclature of Inorganic Compounds

Inorganic compounds are indexed in the direct form, listing cations in the order of increasing valence in the case of polycationic salts of varying valence and in alphabetic order for polycationic salts in which all cations have the same valence; e.g., Sodium Aluminum Silicates and Potassium Sodium Sulfates.

Multicomponent Alloys and Other Systems

Multicomponent alloys, except well-known trade names, are indexed under a main heading in the form "element alloy" for each element in the alloy. The modifier begins with element symbols for each component arranged alphabetically as if the English name for the element were spelled out.

Example: Copper-Gold Alloy is indexed
Copper Alloys
Cu-Au...
Gold Alloys
Cu-Au...

Well-known alloys such as Zircaloy-2 are indexed directly to the trade name; cross references referring from each component of the alloy to the entry for the trade name appear in cumulative indexes.

Multicomponent systems of non-metallic elements are indexed in a manner similar to alloys except the main heading used contains the word "Systems" in place of "Alloys."

Example: Silicon–Tungsten Systems are indexed
Silicon Systems
Si-W...
Tungsten Systems
Si-W...

Multicompound systems and mixtures of compounds are indexed under the main heading for each component com-

pound; the modifiers begin with an alphabetical listing of compound formulas.

Example: Lead Titanate–Lead Zirconate is indexed
Lead Titanates
$PbTiO_3$-$PbZrO_3$...
Lead Zirconates
$PbTiO_3$-$PbZrO_3$...

A mixed system of compounds and elements is indexed using a combined form of the above conventions, e.g., a dispersion of copper and alumina would be indexed

Aluminum Oxides
Al_2O_3-Cu...
Copper Systems
Al_2O_3-Cu..

Physical States and Configurations of Materials

Specification of the physical state, if other than normal, or geometric configuration of the material is included in the modifying phrase, i.e., liquid metals would be indexed to the metal with "liquid" in the modifier, and carbon crucibles would be indexed to Carbon with "crucibles" appropriately placed in the modifier and also to Crucibles if appropriate.

Modifying Phrases

The modifiers appearing under a main heading are written specifically to describe the relation of the item being indexed to that main heading. The modifier, therefore, will generally contain more useful information about that relation than will a title or a phrase written to be used under every main heading assigned to the item. Effort is exerted to begin the modifier with the word judged to be of greatest use to the greatest number of users; this, however, does not obviate the need to consider all modifiers under the main heading(s) of interest.

Modifiers are usually intended to form a meaningful phrase when combined with the main heading. Some are intended to be read following the main heading, e.g., the entry Hydrogen—sorption by charcoal is read "hydrogen sorption by charcoal"; however, as a result of placing the important word first, many modifiers must be arranged for smooth reading, e.g., Formaldehyde—yields in radiolysis of ethyl ether, effects of deuterium on is read "effects of deuterium on formaldehyde yields in radiolysis of ethyl ether" and Uranium—crystal structure of, effect of cooling rate on allotropic transformations in is read "effect of cooling rate on allotropic transformations in crystal structure of uranium." Prepositions are sometimes omitted if no ambiguity results.

Special characters are added to modifiers in the field of physics; if the modifier does not establish the experimental or theoretical character of a reference, a symbol (E), (T), or (E/T) is placed immediately after the modifying phrase and before the journal reference number. The value of this identification has been established by the American Institute of Physics.

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ARL–	**(Non-AEC)**	
65-254	20-46499	See AD-629763
66-0010(Pt.4)	20-45853	See AD-639219
66-0019	20-46806	See AD-628327
66-0113	20-46808	See AD-639956
AWRE-NR–	**(British)**	
3/66	20-46034	Dep. mn. BIS $0.60. HMSO 3s.
AWRE-O–	**(British)**	
50/66	20-46321	Dep. mn. BIS $0.80. HMSO 4s.
BM-RI–	**(Misc.)**	
6834	20-45622	Bureau of Mines Free
6835	20-46163	Bureau of Mines Free
6855	20-46105	Bureau of Mines Free
BMI–	**(Misc.)**	
1782	20-46221	Dep. mn. CFSTI $2.00 cy, $0.50 mn
BMI-X–		
10172	20-47004	Dep. mn. CFSTI $1.00 cy, $0.50 mn
BMwF-FBK–	**(German)**	
66-05	20-46580	Dep. mn
BN–	**(Misc.)**	
6605-02	20-47006	See EURAEC-1666
BNL–		
981	20-45272	Dep. mn. CFSTI $2.00 cy, $0.50 mn
9065	20-46035	Dep. mn. CFSTI $2.00 cy, $0.50 mn
9501	20-47030	Nucl. Appl., 2: 221-5(1966)
10170	20-46740	Phys. Rev., 150: 933-5(1966)
10255	20-46732	Phys. Rev., 150: 851-6(1966)
10395	20-46491	J. Geophys. Res., 71: 4855-60(1966)
10474	20-46036	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10521	20-46222	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10527	20-45948	Dep. mn. CFSTI $2.00 cy, $0.75 mn
10534	20-45351	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10543	20-46223	Dep. mn. CFSTI $3.00 cy, $0.50 mn
10545	20-45913	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10560	20-46224	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10561	20-45914	Dep. mn. CFSTI $2.00 cy, $0.50 mn
10565	20-46250	Dep. mn. CFSTI $2.00 cy, $0.50 mn
10573	20-46330	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10576	20-46037	Dep. mn. CFSTI $1.00 cy, $0.50 mn

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10587	20-46251	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10606	20-46331	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10609	20-46332	Dep. mn. CFSTI $1.00 cy, $0.50 mn
10626	20-46008	Dep. mn. CFSTI $1.00 cy, $0.50 mn
BNWL–		
113-19	20-47091	CFSTI $3.00 cy, $0.50 mn
238	20-46225	Dep. mn. CFSTI $1.00 cy, $0.50 mn
284	20-46964	Dep. mn. CFSTI $2.00 cy, $0.50 mn
299	20-46009	Dep. mn. CFSTI $2.00 cy, $0.50 mn
BNWL-SA–		
305	20-45884	J. Geophys. Res., 71: 4743-8(1966)
633	20-45273	Dep. mn. CFSTI $2.00 cy, $0.50 mn
689	20-46141	Dep. mn. CFSTI $1.00 cy, $0.50 mn
791	20-46226	Dep. mn. CFSTI $2.00 cy, $0.50 mn
825	20-45274	Dep. mn. CFSTI $1.00 cy, $0.50 mn
CALT–		
427-14	20-45915	Dep. mn. CFSTI $1.00 cy, $0.50 mn
CAPE–		
1243	20-45845	EM
1475	20-45847	EM
1479	20-45848	EM
1481	20-45846	EM
CEA-R–	**(French)**	
2876	20-46581	Dep. mn
2942	20-46810	Dep. mn
2970	20-46010	Dep. mn
2978	20-45352	Dep. mn
2984	20-45353	Dep. mn
3030	20-45572	Dep. mn
3034	20-46038	Dep. mn
CERN–	**(European Organization for Nuclear Research)**	
66-25	20-46252	Dep. mn
66-26	20-46253	Dep. mn
CLM-P–	**(British)**	
87	20-46859	Nucl. Fusion, 6: 182-7(1966)
93	20-46865	Nucl. Fusion, 6: 223-7(1966)
94	20-46861	Nucl. Fusion, 6: 200-6(1966)
CLOR–	**(Polish)**	
49/D	20-45949	CFSTI $2.00
CONF-178–	**(European Atomic Energy Society's Symposium on Fuel Cycles for Power Reactors, Baden-Baden, Germany, Sept. 1963)**	
8	20-47043	ORAU
CONF-256–	**20-45832**	**(2nd Southeastern Conference on Theoretical and Applied Mechanics, Atlanta, Ga., Mar. 5–6, 1964) $22.50**
CONF-475–	**20-46802**	**(Conference on Nuclear Spectroscopy and Solid State Physics, Lima, Feb. 1964) Lima, Organizacion de Universidade Catolicas de America Latina, 1964**
CONF-551–	**(Technical Meeting on the Use of Induced Mutations in Plant Breeding Programs, Rome, May–June 1964)**	
5	20-45476	ORAU
7	20-45474	ORAU
CONF-717–	**20-45549**	**(CNRS Meeting on Graft of Allogenic Hematopoietic Cells, Paris, Sept. 7–9, 1964) Colloq. Int. Cent. Nat. Rech. Sci. (Paris), No. 147, 1-480(1965)**
CONF-747–	**(4th Symposium on Radioactivity in Scandinavia, Riso, Denmark, Oct. 5–6, 1964)**	
10	20-45908	ORAU
CONF-631111–	**(International Symposium on Radioactive Contamination of the Human Environment, Hiroshima, Nov. 11–13, 1963)**	
3	20-46001	ORAU
4	20-45909	ORAU
CONF-640107–	**20-46249**	**(Conference on Theoretical Physics, Madras, India, Jan. 3–9, 1964) $12.50**
CONF-650311–	**(Conference on Analytical Chemistry and Applied Spectroscopy, Pittsburgh, Mar. 5, 1965)**	
8	20-45617	ORAU
CONF-650405–	**(International Conference on Modern Trends in Activation Analysis, College Station, Tex., Apr. 19–22, 1965)**	
21	20-45618	ORAU. Gmelin, AED-CONF-65-040-34
CONF-650453–	**20-45868**	**(Nondestructive Evaluation of Aerospace and Weapons Systems Components and Materials, San Antonio, Tex., Apr. 19–21, 1965) $10.00**
CONF-650454–	**20-45553**	**(German X-Ray Society, 46th Session, Nuremberg, Germany, Apr. 29–May 2, 1965) Strahlentherapie, Sonderbaende, 62: 1-307(1966)**
CONF-650675 -	**20-45874**	**(High-Vacuum Technology, Testing, and Measurement Meeting, Cleveland, Ohio, June 8–9, 1965) See NASA-TM-X-1268**
CONF-650802–	**20-46531**	**(Cryogenic Engineering Conference, Houston, Tex., Aug. 23–25, 1965) Advances Cryog. Eng., 11: 1-712(1966)**
CONF-650902–	**(American Chemical Society, 150th National Meeting, Atlantic City, Sept. 12–17, 1965)**	
16	20-45803	See MLM-1292J
CONF-650907–	**(11th International Congress of Radiology, Rome, Sept. 24, 1965)**	
4	20-45356	See EUR-2752.e
CONF-651060–	**(American Public Health Assn., 93rd Annual Meeting, Chicago, Oct. 18–22, 1965)**	
10	20-46005	ORAU. Gmelin, AED-CONF-65-318-12
CONF-651062–	**(Metallurgical Society Fall Meeting, Detroit, Oct. 17–21, 1965)**	
10	20-45701	ORAU. Gmelin, AED-CONF-65-325-23
CONF-651107–	**(American Chemical Society, 1st Midwest Regional Meeting, Kansas City, Mo., Nov. 4–5, 1965)**	
2	20-46013	See RFP-622
CONF-651110–	**(American Society of Mechanical Engineers, Annual Winter Meeting, Chicago, Nov. 7–11, 1965)**	
7	20-45785	ORAU. Gmelin, AED-CONF-65-327-6
CONF-651111–	**20-27000**	**(Symposium in Medicine No. 9 Radioactive Pharmaceuticals, Oak Ridge, Tenn., Nov. 1–4, 1965) Dep. mn. CFSTI $5.00 cy, $3.00 mn**
7	20-45318	ORAU. Gmelin, AED-CONF-65-323-10
CONF-651118–	**20-46801**	**(American Physical Society, Gatlinburg, Tenn., Nov. 11–13, 1965) $7.50**
18	20-46595	See ORO-2098-49
CONF-651126–	**(American Physical Society, 7th Annual Meeting of the Division of Plasma Physics, San Francisco, Nov. 8–11, 1965)**	
19	20-46921	ORAU. Gmelin, AED-CONF-65-353-64
20	20-46923	ORAU. Gmelin, AED-CONF-65-353-47
21	20-46924	ORAU. Gmelin, AED-CONF-65-353-54
22	20-46922	ORAU. Gmelin, AED-CONF-65-353-48
23	20-46915	ORAU. Gmelin, AED-CONF-65-353-58
24	20-46916	ORAU. Gmelin, AED-CONF-65-353-59
25	20-46917	ORAU. Gmelin, AED-CONF-65-353-60
26	20-46918	ORAU. Gmelin, AED-CONF-65-353-52
27	20-46925	ORAU. Gmelin, AED-CONF-65-353-53
CONF-651132–	**20-47096**	**(Atomic Industrial Forum, 12th Annual Conference, Washington, D. C., Nov. 17, 1965) $15.00**
7	20-45785	ORAU. Gmelin, AED-CONF-65-327-6
CONF-651215–	**(Bone Marrow Transplantation and Radiation Recovery**	

Report No.	Abstract No.	Availability
		Conference, San Francisco, Dec. 2–3, 1965)
1	20-45473	ORAU. Gmelin, AED-CONF-65-455-1
CONF-660204–		(American Nuclear Society Meeting, San Diego, Calif., Feb. 7–9, 1966)
8	20-47050	ORAU. Gmelin, AED-CONF-66-017-5
21	20-47003	ORAU. Gmelin, AED-CONF-66-017-15
CONF-660205–		(Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers, New York, Feb. 1966)
7	20-46217	ORAU. Gmelin, AED-CONF-66-021-9
CONF-660206–		(Symposium on Neutron Noise, Waves, and Pulse Propagation, Gainesville, Feb. 14–16, 1966)
20	20-46976	ORAU. Gmelin, AED-CONF-66-014-24
CONF-660207–		(Radioisotope Applications in Aerospace Symposium, Dayton, Ohio, Feb. 15–17, 1966)
5	20-46003	ORAU. Gmelin, AED-CONF-66-011-4
CONF-660220–		(American Nuclear Society, Canadian Nuclear Assn., Nuclear Energy Resources Meeting, Toronto, Canada, Feb. 1, 1966)
1	20-46975	ORAU. Gmelin, AED-CONF-66-022-3
CONF-660303–	20-44603	(American Physical Society, Conference of Neutron Cross Section Technology, Washington, D. C., Mar. 22–24, 1966) Dep. mn. CFSTI $11.25 cy, $4.25 mn
38	20-46575	ORAU. Gmelin, AED-CONF-66-034-23
CONF-660311–		(Symposium on Water Production Using Nuclear Energy, Tucson, Ariz., Mar. 30–Apr. 1, 1966)
4	20-47051	ORAU. Gmelin, AED-CONF-66-037-5
CONF-660319–		(American Society for Metals Sessions, WESTEC Conference, Los Angeles, Mar. 1966)
4	20-46176	ORAU. Gmelin, AED-CONF-66-041-2
CONF-660321–		(Canaveral Council of Technical Societies, 3rd Space Congress, Cocoa Beach, Fla., Mar. 7–10, 1966)
1	20-47052	ORAU. Gmelin, AED-CONF-66-148-1
CONF-660324–		(26th Annual Conference on Physical Electronics, Cambridge, Mass., Mar. 21–23, 1966)
6	20-46328	ORAU. Gmelin, AED-CONF-66-049-3
7	20-46329	ORAU. Gmelin, AED-CONF-66-049-1
CONF-660325–		(Pacific Coast Electrical Assn., Annual Conference, Engineering and Operating Section, San Francisco, Mar. 3–4, 1966)
1	20-47053	ORAU. Gmelin, AED-CONF-66-040-2
CONF-660411–		(American Physical Society Meeting, Washington, D. C., Apr. 25–28, 1966)
52	20-46319	ORAU. Gmelin, AED-CONF-66-060-127
54	20-46387	ORAU. Gmelin, AED-CONF-66-060-132
56	20-46508	ORAU. Gmelin, AED-CONF-66-060-131
CONF-660428–		(Federation of American Societies for Experimental Biology, 50th Meeting, Atlantic City, N. J., Apr. 11–16, 1966)
2	20-45347	ORAU. Gmelin, AED-CONF-66-075-3
CONF-660429–		(American Power Conference, 28th Annual Meeting, Chicago, Ill., Apr. 26–28, 1966)
7	20-47054	ORAU. Gmelin, AED-CONF-66-098-11
8	20-47055	ORAU. Gmelin, AED-CONF-66-098-12
9	20-47056	ORAU. Gmelin, AED-CONF-66-098-15
CONF-660430–		(Ohio Academy of Science, 75th Annual Meeting, Columbus, Ohio, Apr. 21–23, 1966)
2	20-46574	ORAU. Gmelin, AED-CONF-66-105-2
CONF-660431–		(Symposium on Hot Atom Chemistry, Lafayette, Ind., Apr. 1–2, 1966)
7	20-45762	ORAU. Gmelin, AED-CONF-66-120-1
CONF-660433–		(American Radium Society, 48th Annual Meeting, Phoenix, Ariz., Apr. 13–16, 1966)
5	20-45568	ORAU. Gmelin, AED-CONF-66-064-1
CONF-660435–		(Institute of Environmental Sciences, Technical Meeting and Equipment Exposition, San Diego, Calif., Apr. 13–15, 1966)
1	20-46977	ORAU. Gmelin, AED-CONF-66-079-1
CONF-660441–		(Biometric Society Inst. of Mathematical Statistics, Eastern Regions Joint Meeting, Upton, New York, Apr. 27–29, 1966)
1	20-45472	ORAU. Gmelin, AED-CONF-66-118-1
CONF-660444–		(International School on Symmetry of Elementary Particles, Yalta, U.S.S.R., Apr. 14–May 5, 1966)
1	20-46344	See UCRL-16968
CONF-660505–	20-27419	(American Ceramic Society Meeting, Washington, D. C., May 7–12, 1966) American Nuclear Society, 1966
12	20-46224	See BNL-10560
CONF-660507–		(Symposium for the Disposal of Radioactive Waste Into Sea, Oceans, and Surface Waters, Vienna, May 17, 1966)
12	20-45910	ORAU
19	20-47089	ORAU
28	20-47090	ORAU
CONF-660510–	20-39510	(International Conference on Isochronous Cyclotrons, Gatlinburg, Tenn., May 2–5, 1966) Trans. Nucl. Sci., NS-13: No. 4, 1-531(1966)
4	20-46256	See LA-DC-7642
CONF-660516–		(Annual Conference on Organic and Heavy Water Reactors, Winnipeg, Canada, May 30–June 1, 1966)
5	20-47008	ORAU. Gmelin, AED-CONF-66-138-5
6	20-47046	ORAU. Gmelin, AED-CONF-66-138-2
CONF-660518–		(AEC Annual Metallography Meeting, Denver, May 18–20, 1966)
7	20-46164	See DP-MS-66-8
CONF-660521–		(International Symposium on In-Pile Irradiation Equipment and Techniques, Harwell, England, May 10–12, 1966)
3	20-47064	See JUL-373-RB-RX
CONF-660524–		(2nd International Thorium Fuel Cycle Symposium, Gatlinburg, Tenn., May 3–6, 1966)
8	20-47010	ORAU. Gmelin, AED-CONF-66-104-9
11	20-47009	ORAU. Gmelin, AED-CONF-66-104-11
16	20-47047	ORAU. Gmelin, AED-CONF-66-104-14
18	20-47015	See ORNL-P-2397
CONF-660539–		(American Society for Microbiology, 66th Annual Meeting, Los Angeles, Calif., May 1–5, 1966)
1	20-45475	ORAU. Gmelin, AED-CONF-66-114-1
CONF-660546–		(American Society of Civil Engineers, Water Resources Engineering Conference, Denver, Colo., May 16–20, 1966)
1	20-47048	ORAU. Gmelin, AED-CONF-66-111-2
CONF-660547–		(Virginia Academy of Science, 44th Annual Meeting, Harrisonburg, Virginia, May 4–7, 1966)
2	20-47081	ORAU. Gmelin, AED-CONF-66-122-4
CONF-660606–	20-34872	(American Nuclear Society Meeting, Denver, June 19–23, 1966) Trans. Amer. Nucl. Soc., 9: 1-322(1966)
29	20-46175	ORAU. Gmelin, AED-CONF-66-203-53
CONF-660607–		(3rd International Symposium on the Effects of Irradiation on Structural Metals, Atlantic City, June 29–July 1, 1966)
3	20-46228	See NRL-6415
CONF-660609–		(International Symposium on Food Irradiation Meeting, Karlsruhe, Germany, June 6–10, 1966)
4	20-46125	ORAU
11	20-46123	ORAU
15	20-46124	ORAU

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CONF-660614–	**(3rd International Congress on Radiation Research, Cortina, Italy, June 1966)**	
5	20-45366	See UCSF-10P2-14
CONF-660616–	**(7th Annual Inst. of Nuclear Materials Management, Columbus, Ohio, June 15, 1966)**	
2	20-46002	ORAU. Gmelin, AED-CONF-66-185-2
3	20-46177	ORAU. Gmelin, AED-CONF-66-185-4
CONF-660619–	**(3rd International Materials Symposium on Ceramic Microstructure, Berkeley, Calif., June 13–16, 1966)**	
3	20-46191	See ORNL-P-2371
CONF-660621–	**(Health Physics Society, 11th Annual Meeting, Houston, Tex., June 27–30, 1966)**	
11	20-46004	ORAU. Gmelin, AED-CONF-66-193-3
12	20-45569	ORAU. Gmelin, AED-CONF-66-193-4
CONF-660633–	**(American Physical Society, Division of Plasma Physics, Minneapolis, Minn., June 1966)**	
2	20-46530	ORAU. Gmelin, AED-CONF-66-199-6
4	20-46529	ORAU. Gmelin, AED-CONF-66-199-10
6	20-46314	ORAU. Gmelin, AED-CONF-66-199-3
7	20-46920	ORAU. Gmelin, AED-CONF-66-199-7
9	20-46919	ORAU. Gmelin, AED-CONF-66-199-8
10	20-46421	ORAU. Gmelin, AED-CONF-66-199-14
CONF-660638–	**(Conference on Particle Physics, Boulder, Colo., June 1966)**	
1	20-46338	See NYO-3399-78
CONF-660703–	**(Panel Meeting on the Use of Neutrons in Seed Irradiation, Vienna, Austria, July 22–29, 1966)**	
2	20-45360	See ORNL-P-2435
CONF-660708–	**(Institute of Electrical and Electronics Engineers, Summer Meeting, New Orleans, La., July 10–15, 1966)**	
1	20-47049	ORAU
7	20-47044	ORAU
8	20-47045	ORAU
CONF-660805–	**(International Conference on Solvent Extraction, Goteborg, Sweden, Aug. 27–Sept. 1, 1966)**	
5	20-45800	See ORO-2576-23
CONF-660808–	**(13th International Conference on High Energy Physics, Berkeley, Calif., Aug. 31–Sept. 7, 1966)**	
11	20-46330	See BNL-10573
12	20-46345	See UCRL-17087
13	20-46333	See COO-264-343
14	20-46346	See UCRL-17088
15	20-46392	See UCSD-10P10-9
16	20-46332	See BNL-10609
17	20-46331	See BNL-10606
CONF-660809–	**(Microsymposium on Electron Microscopy, Walnut Creek, Calif., Aug. 18–19, 1966)**	
1	20-46192	See RFP-807
CONF-660811–	**(American Physical Society Meeting, Mexico City, Mexico, Aug. 29–31, 1966)**	
2	20-46597	See RLO-1388-14
CONF-660817–	**(International Symposium on Why and How Should We Investigate Nuclides Far Off the Stability Line, Lysekil, Sweden, Aug. 21–27, 1966)**	
3	20-45766	See LA-DC-8103
CONF-660906–	**(International Conference on Nuclear Physics, Gatlinburg, Tenn., Sept. 12–17, 1966)**	
18	20-46594	See ORNL-P-2438
20	20-46600	See UCD-CNL-51
22	20-46593	See ORNL-P-2437
23	20-46604	See UCRL-16986
33	20-46340	See PUC-937-224
CONF-660910–	**(International Congress on Occupational Health, Vienna, Austria, Sept. 19–24, 1966)**	
1	20-45954	See LA-DC-7582
CONF-660917–	**(Gastrointestinal Radiation Injury Symposium, Richland, Washington, Sept. 25–28, 1966)**	
2	20-45351	See BNL-10534
3	20-45359	See ORNL-P-2407
CONF-660918–	**(International Conference on Instrumentation for High Energy Physics, Stanford, Calif., Sept. 9–10, 1966)**	
1	20-46037	See BNL-10576
2	20-46250	See BNL-10565
4	20-46054	See UCRL-17121
5	20-46053	See UCRL-17114
CONF-660919–	**(Conference on Applications of Thermoluminescence to Geological Problems, Spoleto, Italy, Sept. 5–16, 1966)**	
1	20-45913	See BNL-10545
2	20-45914	See BNL-10561
CONF-660920–	**(1st International Congress of the International Radiation Protection Assn., Rome, Italy, Sept. 5–10, 1966)**	
1	20-45284	See K-C-822
2	20-45273	See BNWL-SA-633
3	20-45948	See BNL-10527
4	20-45274	See BNWL-SA-825
6	20-45833	See UCRL-14778
CONF-660922–	**(7th International Machine Tool Design and Research Conference, Birmingham, England, Sept. 12–16, 1966)**	
1	20-46146	See Y-KE-204(Rev.)
CONF-660923–	**(Solid State Conference on Interaction of Radiation with Solids, Cairo, Egypt, Sept. 3–7, 1966)**	
1	20-46223	See BNL-10543
CONF-660925–	**(Seminar on Intense Neutron Sources, Santa Fe, N. Mex., Sept. 19–23, 1966)**	
2	20-46559	See ORNL-P-2493
CONF-660929–	**(Conference on Optical Properties of Ions in Solids, Baltimore, Md., Sept. 12–14, 1966)**	
1	20-46942	See NYO-2150-18
CONF-661001–	**(14th Conference on Remote Systems and Technology, Pittsburgh, Oct. 30–Nov. 4, 1966)**	
2	20-45837	See UCRL-14733
3	20-46016	See UCRL-14734
7	20-47005	Dep. mn. CFSTI $1.00 cy, $0.50 mn
11	20-45953	See ISO-SA-23
20	20-45836	See ORNL-P-2356
CONF-661003–	**(AIME Nuclear Metallurgy Symposium on High Temperature Nuclear Fuels, Delavan, Wis., Oct. 3–5, 1966)**	
2	20-46141	See BNWL-SA-689
4	20-46226	See BNWL-SA-791
5	20-46222	See BNL-10521
CONF-661007–	**(Institute of Electrical and Electronics Engineers, 22nd National Electronics Conference and Exhibits, Chicago, Ill., Oct. 3–5, 1966)**	
1	20-46052	See UCRL-16814
CONF-661011–	**(AEC Contractors' Nuclear Materials Management Meeting, Berkeley, Calif., Oct. 3–5, 1966)**	
4	20-46055	See Y-MA-901
CONF-661014–	**(IAEA Conference on Nuclear Data, Paris, France, Oct. 17–21, 1966)**	
1	20-46588	See LA-DC-7853
CONF-661015–	**(National Conference on Pollution and Our Environment, Montreal, Canada, Oct. 31–Nov. 4, 1966)**	
1	20-45942	See AECL-2478
CONF-661016–	**(Symposium on Engineering Problems of Controlled Thermonuclear Research, Gatlinburg, Tennessee, Oct. 3–6, 1966)**	
3	20-46827	See UCRL-70014
4	20-46828	See UCRL-70015
5	20-46831	See UCRL-70024
6	20-46018	See UCRL-70016
7	20-45829	See UCRL-70034
9	20-46830	See UCRL-70021
10	20-46832	See UCRL-70030
11	20-45838	See UCRL-70017

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12	20-45839	See UCRL-70020
13	20-46829	See UCRL-70019
14	20-46229	See UCRL-70022
16	20-46818	See MATT-383
17	20-45840	See UCRL-70029
CONF-661102–	**(American Society of Mechanical Engineers, Winter Annual Conference, New York, Nov. 27, 1966)**	
6	20-46036	See BNL-10474
COO–		
119-234	20-45275	Dep. mn. CFSTI $7.00 cy, $1.50 mn
264-343	20-46333	Dep. mn. CFSTI $1.00 cy, $0.50 mn
427-54	20-46731	Phys. Rev., 150: 846-51(1966)
875-39	20-45340	Photochem. Photobiol., 5: 201-5(1966)
1001-8	20-45654	J. Inorg. Nucl. Chem., 28: 2395-8(1966)
1142-66	20-45708	J. Phys. Chem., 70: 3135-9(1966)
1184-4	20-45283	Dep. mn. CFSTI $5.00 cy, $1.00 mn
1249-4	20-45355	Dep. mn. CFSTI $3.00 cy, $0.75 mn
1420-126(Vol.1)	20-46582	Dep. mn. CFSTI $5.00 cy, $1.00 mn
1545-13	20-46254	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1569-1	20-46509	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1617-2	20-45762	See CONF-660431-7
D–	**(Misc.)**	
1-82-0499	20-46805	See AD-628323
DP–		
1007	20-47013	Dep. mn. CFSTI $6.00 cy, $1.25 mn
1033	20-46127	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1035	20-46039	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1046	20-45573	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1054	20-46993	Dep. mn. CFSTI $1.00 cy, $0.50 mn
DP-MS–		
66-8	20-46164	Dep. mn. CFSTI $1.00 cy, $0.50 mn
EANDC(E)–	**(European–American Nuclear Data Committee)**	
73(U)	20-46583	See IKF-17
EANDC(UK)–	**(European–American Nuclear Data Committee)**	
3	20-46553	Dep. mn
52-S	20-46554	Dep. mn
ECON–	**(Non-AEC)**	
2736	20-46029	See AD-639587
01420-1	20-46097	See AD-630344
EFINS–	**(Misc.)**	
61-34	20-46450	See AD-628255
66-80	20-46333	See COO-264-343
EGG–		
1183-1056	20-46040	Dep. mn. CFSTI $2.00 cy, $0.50 mn
ER–	**(Misc.)**	
20	20-46822	See NP-16323
ESD-TDR–	**(Non-AEC)**	
65-596	20-45911	See AD-628148
EUR–	**(European Atomic Energy Community)**	
2701.f	20-46810	See CEA-R-2942
2752.e	20-45356	Dep. mn
2821	20-46965	See EURAEC-1608
2858	20-47006	See EURAEC-1666
2867	20-46184	See EURAEC-1677
3057.e	20-47063	Dep. mn
3060.f	20-45357	Dep. mn
3064.f	20-45574	Dep. mn
3065.f	20-45932	Dep. mn
3117.e	20-46011	Dep. mn
EURAEC–		
1608	20-46965	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1661	20-47017	See WCAP-3385-8
1666	20-47006	Dep. mn. CFSTI $3.00 cy, $0.75 mn
1677	20-46184	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1704	20-45855	See GEAP-5191
1705	20-45856	See GEAP-5203
FEI–	**(Russian)**	
37	20-46041	Dep. mn
FTD-MT–	**(Non-AEC)**	
64-295	20-46194	For translation see AD-634697
GEAP–	**(Misc.)**	
4675	20-46185	Dep. mn. CFSTI $1.00 cy, $0.50 mn
4877	20-46142	Dep. mn. CFSTI $1.00 cy, $0.50 mn
5014	20-46186	Dep. mn. CFSTI $1.00 cy, $0.50 mn
5147	20-46981	Dep. mn. CFSTI $4.00 cy, $0.50 mn
5191	20-45855	Dep. mn. CFSTI $1.00 cy, $0.50 mn
5203	20-45856	Dep. mn. CFSTI $3.00 cy, $0.75 mn
HASL–		
177	20-46042	Dep. mn. CFSTI $2.00 cy, $0.50 mn
178	20-45950	Dep. mn. CFSTI $2.00 cy, $0.50 mn
179	20-45951	Dep. mn. CFSTI $1.00 cy, $0.50 mn
HI–	**(Non-AEC)**	
647-RR	20-45952	
HW–		
66081	20-46143	Dep. mn. CFSTI $3.00 cy, $0.75 mn
67765	20-46144	Dep. mn. CFSTI $3.00 cy, $0.75 mn
IAE–	**(Non-AEC)**	
1154	20-46811	Dep. mn
IAEA–	**(International Atomic Energy Agency)**	
2607-12	20-45258	Dep. mn. CFSTI $2.00 cy, $0.50 mn
IBJ–	**(Polish)**	
See INR		
IEA–	**(Brazilian)**	
95	20-46170	Met., ABM (Ass. Brasil. Metais), 21: 369-76(1965)
IFJ–	**(Polish)**	
See INP		
IITRI–	**(Misc.)**	
578P21-21	20-46982	Dep. mn. CFSTI $1.00 cy, $0.50 mn
578P25-16	20-46721	Phys. Rev., 150: 791-3(1966)
IKF–	**(German)**	
17	20-46583	Dep. mn
18	20-46255	Dep. mn
INP–	**(Polish)**	
472/PL	20-46584	Dep.
482/PL	20-46585	Dep.
INR–	**(Non-AEC)**	
687/VII/PH	20-46500	Dep.
697/XIV/PS	20-46012	Dep.
IPST-Cat.–	**(Russian)**	
1455	20-46147	For translation see NASA-TT-F-359
1509	20-46260	For translation see AEC-tr-6636
1530	20-45801	For translation see AEC-tr-6638
IS–		
1330	20-46735	Phys. Rev., 150: 886-93(1966)
1450	20-45623	Dep. mn. CFSTI $3.00 cy, $0.50 mn
IS-T–		
96	20-46334	Dep. mn. CFSTI $3.00 cy, $0.75 mn
ISO-SA–		
23	20-45953	Dep. mn. CFSTI $2.00 cy, $0.50 mn
JINR–	**(Russian)**	
P-2769	20-46586	Dep. mn
P-2794	20-46587	Dep. mn
P-2829	20-46812	Dep. mn
P-2846	20-46927	Dep. mn
P-2871	20-46335	Dep. mn
JNPC-MWP–	**(British)**	
(GSG)/P(66)51	20-45632	See TRG-Report-1258

Report No.	Abstract No.	Availability
JPRS–	(Non-AEC)	
36843	20-45965	CFSTI $4.00 cy, $0.75 mn
JUL–	(German)	
358-PP	20-46813	Dep. mn
360-PP	20-46814	Dep. mn
373-RB-RX	20-47064	Dep. mn
374-PP	20-46815	Dep. mn
381-PP	20-46816	Dep. mn
383-RB	20-45624	Dep. mn
384-PP	20-46817	Dep. mn
K-C–		
822	20-45284	Dep. mn. CFSTI $2.00 cy, $0.50 mn
KFK–	(German)	
409	20-46976	See CONF-660206-20
LA–		
3500	20-45827	Dep. mn. CFSTI $4.00 cy, $0.75 mn
3538(Vol.1)	20-46555	Dep. mn. CFSTI $7.00 cy, $1.75 mn
3538(Vol.2)	20-46556	Dep. mn. CFSTI $7.00 cy, $1.75 mn
3557	20-46227	Dep. mn. CFSTI $2.00 cy, $0.50 mn
LA-DC–		
7579	20-45429	Radiat. Res., 29: 114-20(1966)
7582	20-45954	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7642	20-46256	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7782	20-46628	J. Inorg. Nucl. Chem., 28: 2424-7(1966)
7835	20-45394	Genetics, 54: 755-61(1966)
7853	20-46588	Dep. mn. CFSTI $1.00 cy, $0.50 mn
7932	20-46736	Phys. Rev., 150: 894-905(1966)
8103	20-45766	Dep. mn. CFSTI $1.00 cy, $0.50 mn
LA-tr–		
66-46	20-46611	Dep. mn. CFSTI $1.00 cy, $0.50 mn. JCL $1.60 fs, $0.80 mf
LF–		
29	20-45320	Dep. mn. CFSTI $1.00 cy, $0.50 mn
LFEN–	(Portuguese)	
39	20-46187	Dep. mn
LNF–	(Italian)	
66/37	20-46336	Dep. mn
66/38	20-46257	Dep. mn
MATT–		
354	20-46880	Phys. Fluids, 9: 1856-9(1966)
383	20-46818	Dep. mn. CFSTI $2.00 cy, $0.50 mn
407	20-46873	Phys. Fluids, 9: 1814-21(1966)
MCW–		
1448	20-45625	Dep. mn. CFSTI $2.00 cy, $0.50 mn
MIT–	(Misc.)	
905-45	20-46633	Nucl. Appl., 2: 256-8(1966)
905-69	20-46719	Phys. Lett., 23: 269-71(1966)
1381-12	20-45916	Dep. mn. CFSTI $6.00 cy, $1.25 mn
MLM–		
1292J	20-45803	J. Inorg. Nucl. Chem., 28: 2193-9(1966)
1339	20-46043	Dep. mn. CFSTI $2.00 cy, $0.50 mn
1340	20-45955	Dep. mn. CFSTI $2.00 cy, $0.50 mn
NAA-SR–		
12010	20-46966	Dep. mn. CFSTI $7.00 cy, $1.50 mn
NAA-SR-Memo–		
8324	20-47014	Dep. mn. CFSTI $1.00 cy, $0.50 mn
11822	20-47065	Dep. mn. CFSTI $2.00 cy, $0.50 mn
11892	20-46557	Dep. mn. CFSTI $2.00 cy, $0.50 mn
11992	20-45835	Dep. mn. CFSTI $2.00 cy, $0.50 mn
NASA-CR–	(Misc.)	
591	20-45626	CFSTI $2.00 cy, $0.50 mn
54092	20-46188	
54093	20-46145	
72035	20-46154	
NASA-TM–	(Misc.)	
X-1268	20-45874	CFSTI $6.00 cy, $1.25 mn
X-53453(Vol.3)	20-46165	
NASA-TN–	(Misc.)	
D-3483	20-46189	CFSTI $2.00 cy, $0.50 mn
D-3597	20-46166	CFSTI $2.00 cy, $0.50 mn
D-3638	20-46510	CFSTI $1.00 cy, $0.50 mn
D-3641	20-46294	CFSTI $1.00 cy, $0.50 mn
D-3656	20-45869	CFSTI $2.00 cy, $0.50 mn
NASA-TT–	(Non-AEC)	
F-359	20-46147	CFSTI $8.12 cy, $2.25 mn
NDL-TM–	(Non-AEC)	
34	20-46028	See AD-639048
NP–	(AEC File No. for Non-AEC Reports)	
16185	20-46589	Dep. mn
16208	20-45358	Dep. mn
16257	20-45956	Dep. mn
16262	20-45886	Dep. mn
16290	20-45887	Dep. mn
16293	20-46819	Dep. mn
16309	20-46590	Dep. mn
16311	20-46190	Dep. mn
16312	20-46258	Dep. mn
16319	20-46456	
16321	20-46820	Dep. mn
16322	20-46821	Dep. mn
16323	20-46822	Dep. mn
16329	20-46337	Dep. mn
NP-tr–	(AEC File No. for Non-AEC Translations)	
1422	20-46129	Dep. mn. JCL $1.60 fs, $0.80 mf
1423	20-46130	Dep. mn. JCL $1.60 fs, $0.80 mf
1427	20-46019	Dep. mn. JCL $1.10 fs, $0.80 mf
1428	20-46056	Dep. mn. JCL $1.60 fs, $0.80 mf
NRL–	(Misc.)	
6391	20-46807	See AD-639658
6415	20-46228	Dep. mn. CFSTI $2.00 cy, $0.50 mn
NYO–		
2043-129	20-45248	Dep. mn. CFSTI $4.00 cy, $0.75 mn
2150-18	20-46942	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2262TA-129	20-46591	Dep. mn. CFSTI $3.00 cy, $0.75 mn
2577-3	20-45259	Dep. mn. CFSTI $4.00 cy, $0.75 mn
3246-6	20-46044	Dep. mn. CFSTI $3.00 cy, $0.75 mn
3246-7	20-46045	Dep. mn. CFSTI $2.00 cy, $0.50 mn
3246-8	20-46046	Dep. mn. CFSTI $3.00 cy, $0.50 mn
3364-23	20-45957	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3399-77	20-46390	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3399-78	20-46338	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3525-8	20-46688	Nucl. Phys., 89: 697-704(1966)
3525-9	20-46662	Nucl. Phys., 89: 369-76(1966)
3654-1	20-45888	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3708-1	20-46295	Dep. mn. CFSTI $1.00 cy, $0.50 mn
ORNL–		
3272	20-46994	Dep. mn. CFSTI $2.00 cy, $0.50 mn
3794(Rev.)	20-45627	Dep. mn. CFSTI $4.00 cy, $1.00 mn
3856	20-46558	Dep. mn. CFSTI $4.00 cy, $1.00 mn
3893	20-46047	Dep. mn. CFSTI $3.00 cy, $0.50 mn
3945	20-45787	Dep. mn. CFSTI $6.00 cy, $1.50 mn
3973(Vol.1)	20-46240	Dep. mn. CFSTI $3.00 cy, $0.75 mn
3973(Vol.2)	20-46931	Dep. mn. CFSTI $2.00 cy, $0.50 mn
4013	20-46102	Dep. mn. CFSTI $2.00 cy, $0.50 mn
ORNL-P–	(Misc.)	
1357	20-45298	Health Phys., 12: 1437-51(1966)
2027	20-46871	Phys. Fluids, 9: 1798-1804(1966)
2075	20-46882	Phys. Fluids, 9: 1871-2(1966)
2098	20-46746	Phys. Rev., 150: 996-1010(1966)
2142	20-46667	Nucl. Phys., 89: 419-32(1966)
2283	20-46720	Phys. Rev., 150: 783-90(1966)
2334	20-46722	Phys. Rev., 150: 793-800(1966)
2356	20-45836	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2371	20-46191	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2397	20-47015	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2407	20-45359	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2435	20-45360	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2437	20-46593	Dep. mn. CFSTI $1.00 cy, $0.50 mn

Report No.	Abstract No.	Availability
2438	20-46594	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2493	20-46559	Dep. mn. CFSTI $1.00 cy, $0.50 mn
ORNL-RSIC–		
15	20-46984	Dep. mn. CFSTI $3.00 cy, $0.75 mn
ORNL-TM–		
1552	20-46560	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1573	20-46943	Dep. mn. CFSTI $4.00 cy, $0.75 mn
1603	20-46935	Dep. mn. CFSTI $3.00 cy, $0.75 mn
1632	20-46936	Dep. mn. CFSTI $1.00 cy, $0.50 mn
ORNL-tr–		
1282	20-47018	Dep. mn. JCL $1.60 fs, $0.80 mf
1284	20-47019	Dep. mn. JCL $1.60 fs, $0.80 mf
1328	20-46983	Dep. mn. JCL $1.10 fs, $0.80 mf
ORO–		
2098-49	20-46595	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2418-1	20-45715	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2504-98	20-46339	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2576-23	20-45800	Dep. mn. CFSTI $1.00 cy, $0.50 mn
2915-50	20-46357	Nucl. Phys., 87: 256-66(1966)
3461-8a	20-45285	Dep. mn. CFSTI $1.00 cy, $0.50 mn
3461-8b	20-45286	Dep. mn. CFSTI $1.00 cy, $0.50 mn
PA-TR–	**(Non-AEC)**	
3367	20-45268	See AD-638991
PAN–	**(Polish)**	**(This series of reports was terminated in 1965. Subsequent reports are identified by the code INR.)**
PATENTS	**(British)**	**(4s. 6d. each, U. K. Patent Office)**
1,038,133	20-46979	
1,038,419	20-47042	
1,039,072	20-46096	
1,039,410	20-46126	
1,040,704	20-46095	
1,041,041	20-46990	
1,041,042	20-46991	
1,041,043	20-46992	
1,041,044	20-46989	
1,041,641	20-45852	
1,041,747	20-46007	
1,042,144	20-45619	
1,042,595	20-45861	
1,043,543	20-45825	
PATENTS	**(Canadian)**	
738,541	20-46988	
740,525	20-47012	
740,804	20-47011	
PATENTS	**(German)**	
1,216,445	20-47040	
1,218,079	20-46980	
1,218,624	20-46987	
1,219,596	20-46180	
1,220,048	20-47088	
1,220,530	20-46926	
1,220,532	20-46178	
1,220,616	20-45820	
1,221,366	20-45620	
PATENTS	**(Japanese)**	
1965-7440	20-46270	
1965-9846	20-45764	
1965-18431	20-45765	
1965-20831	20-46272	
1965-20832	20-46271	
PATENTS	**(U. S.)**	**($0.50 each, U. S. Patent Office)**
3,258,645	20-45872	
3,258,909	20-45873	
3,258,911	20-46128	
3,259,456	20-45823	
3,259,748	20-45849	
3,264,191	20-47041	
3,264,222	20-46218	
3,264,475	20-45930	
3,264,741	20-45850	
3,264,952	20-46978	
3,265,574	20-45501	
3,265,604	20-45763	
3,268,288	20-45822	
3,268,315	20-46181	
3,268,328	20-46219	
3,268,349	20-46153	
3,268,730	20-46576	
3,268,746	20-46449	
3,268,800	20-45931	
3,269,536	20-45851	
3,269,915	20-45784	
3,270,203	20-46027	
3,270,413	20-46179	
3,271,163	20-45826	
3,271,205	20-46159	
3,271,315	20-46238	
3,271,572	20-46026	
3,272,602	20-46152	
3,272,620	20-45821	
3,273,973	20-45824	
PEL–	**(South African)**	
102	20-47084	Dep. mn
PG-Report–	**(British)**	
587	20-45889	Dep. BIS $2.00. HMSO 10s.
PHS–	**(Misc.)**	
999-RH-18	20-45502	Public Health Service Free
PR–	**(Non-AEC)**	
11	20-46820	See NP-16321
PUC–		
937-175	20-46139	Dep. mn. CFSTI $2.00 cy, $0.50 mn
937-205	20-46741	Phys. Rev., 150: 935-40(1966)
937-211	20-46596	Dep. mn. CFSTI $6.00 cy, $1.25 mn
937-224	20-46340	Dep. mn. CFSTI $1.00 cy, $0.50 mn
R–	**(Misc.)**	
482	20-46551	See AD-640260
RCC-R–	**(British)**	
179	20-45287	Dep. BIS $0.50. HMSO 2s. 6d.
RFP–		
384	20-45959	Dep. mn. CFSTI $1.00 cy, $0.50 mn
622	20-46013	Dep. mn. CFSTI $1.00 cy, $0.50 mn
807	20-46192	Dep. mn. CFSTI $1.00 cy, $0.50 mn
811	20-45960	Dep. mn. CFSTI $1.00 cy, $0.50 mn
RLO–		
1388-14	20-46597	Dep. mn. CFSTI $1.00 cy, $0.50 mn
1750-8(Vol.2)	20-45260	Dep. mn. CFSTI $4.00 cy, $1.00 mn
1750-8(Vol.3)	20-45262	Dep. mn. CFSTI $4.00 cy, $0.75 mn
RM–	**(Misc.)**	
11	20-46452	See AD-630094
4827-TAB	20-45962	Dep. mn. CFSTI $2.00 cy, $0.50 mn
RMD–	**(Misc.)**	
5084-F	20-45702	See UCRL-13222
RPI–	**(Misc.)**	
328-68	20-46598	Dep. mn. CFSTI $5.00 cy, $1.25 mn
RT-BIO–	**(Italian)**	
(65)29	20-45393	Genet. Agr., 19: 243-62(1965)
SAN–		
322-4	20-45288	Dep. mn. CFSTI $1.00 cy, $0.50 mn
632-1	20-45321	Dep. mn. CFSTI $1.00 cy, $0.50 mn
SC-CR–		
66-2047	20-47092	Dep. mn. CFSTI $5.00 cy, $1.00 mn
SC-M–		
66-451	20-45879	Dep. mn. CFSTI $1.00 cy, $0.50 mn
SC-R–		
65-1000	20-45672	Pyrodynamics, 3: 121-34(1965)

Report No.	Abstract No.	Availability
66-896	20-46241	Dep. mn. CFSTI $1.00 cy, $0.50 mn
SC-RR-		
66-280	20-46457	Dep. mn. CFSTI $1.00 cy, $0.50 mn
66-357	20-46426	Dep. mn. CFSTI $2.00 cy, $0.50 mn
66-358	20-46322	Dep. mn. CFSTI $2.00 cy, $0.50 mn
66-506	20-46296	Dep. mn. CFSTI $3.00 cy, $0.50 mn
SC-TM-		
65-289	20-46014	Dep. mn. CFSTI $1.00 cy, $0.50 mn
SLAC-		
66	20-46341	Dep. mn. CFSTI $4.00 cy, $0.75 mn
SLAC-Trans-		
44	20-46348	Dep. mn. JCL $5.60 fs, $2.00 mf
SM-	**(Misc.)**	
60/44	20-46554	See EANDC(UK)-52-S
51974	20-46454	See AD-630182
51997	20-46455	See AD-630183
STI-DOC-	**(International Atomic Energy Agency)**	
10-57	20-45510	IAEA: $4.50; S94.50; £ 1.7.0; F Fr 18,-; DM 15,75
SU-IPR-	**(Misc.)**	
90	20-46823	Dep. mn. CFSTI $2.00 cy, $0.50 mn
SWRI-		
1228P1-28	20-45862	Dep. mn. CFSTI $3.00 cy, $0.75 mn
1228P2-28	20-45862	See SWRI-1228P1-28
1228P5-28	20-45862	See SWRI-1228P1-28
SZS-	**(German)**	
6/66	20-45963	Dep. mn
7/66	20-45964	Dep. mn
TID-		
22152	20-45662	J. Phys. Chem., 70: 3037-41(1966)
22296	20-46644	Nucl. Phys., 89: 154-64(1966)
22622	20-45361	Dep. mn. CFSTI $1.00 cy, $0.50 mn
23208	20-45330	Cancer Res., 26: 2045-52(1966)
23239	20-46242	Dep. mn. CFSTI $2.00 cy, $0.50 mn
23311	20-45362	Dep. mn. CFSTI $2.00 cy, $0.50 mn
23347	20-45363	ORAU
TN-	**(Non-AEC)**	
1965-64	20-45911	See AD-628148
TR-	**(Misc.)**	
19	20-46821	See NP-16322
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